



THE SAFETY SOLUTIONS COMPANY

Fittings Manual



FM 36179



Kee Klamp®

A connection system that has revolutionised tubular structures

Tubing is an inherently efficient structural component. It combines strength with lightness and has no projecting corners. It is inexpensive, can be obtained in a wide range of sizes and thickness, and is freely available worldwide.

The difficulty arises in joining tube to form structures. Threaded tube must be supplied in set lengths and is therefore relatively expensive and inflexible in application. Welding is labour intensive and requires a highly skilled workforce.

The answer is provided by the **Kee Klamp Fitting** which has become the basis of a rigid tubular construction system proven the world over. The underlying principle is simple but highly effective - a slip-on fitting that can be used to create versatile and rigid tubular structures.

The Kee Klamp principle has been developed and refined over more than 60 years into an extensive range of fittings that cater for all forms of tubular structure. The fittings range is covered in this manual.

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STRUCTURES DIVISION

The Structures Division offers a unique service to Kee Klamp customers. As Kee Klamp specialists, using the latest three dimensional computer design technology, the Structures Division will undertake complete projects from initial concept to final installation.

Our technical sales staff are ready to interpret your drawings or make site visits to discuss your proposals. The Kee Klamp Structures Division has a fabrication shop which is equipped with all necessary tube cutting, bending equipment.

Our nationwide installation teams have the experience and expertise necessary to complete projects quickly, efficiently and with minimum disruption to other trades.

FITTINGS ADVISORY SERVICE

For all technical or general enquiries please call the Kee Klamp Information Helpline.

+44 (0) 118 931 1022

Internet: www.keeklamp.com

E-mail: sales@keeklamp.com

QUALITY ASSURANCE

Quality is the overriding priority at Kee Klamp Limited. It begins in the foundry where all our fittings are manufactured and galvanised to British Standard (ISO) Requirements, and subject to stringent visual inspection on completion. Our Structures Division uses only British Standard tube and designs structures to British Standard Requirements.

TÜV APPROVAL

TÜV, Europe's leading Independent Testing House, has approved the following Kee Klamp fittings in sizes 5 to 9:



10,A10,12,A12,14,15,16,17,19,19-85,20,21,A21/A26,25,26,27,28,29,30,35,A35,40,A40,45,A45,46,F50,M50,M51,M52,BC53,55,56,M58,60,61,62,63,64,65,67,68,69,70,75,86,87,88,89,114,115,121,145.

The maximum load of each fitting type is as stated on the TÜV Certificate, a copy of which is available on request. The technical descriptions featured in this manual have not been part of the testing.

HEALTH AND SAFETY

No Kee Klamp fittings have been found to be hazardous within the meaning of the COSHH Regulations 1988, assuming that the materials are cut and assembled using normal pipe cutters, saws and hexagonal keys.

Kee Klamp fittings are designed so that the need to weld tubes is avoided - an added safety element since welding processes do have COSHH implications, especially if the tube is pre-galvanised or has any other pre-finish.

ACCESSORIES

Kee Klamp Limited manufacture and supply a wide range of accessories. Weldmesh panels (see page 36) can be fabricated in the following range of popular mesh sizes: 50 x 50, 25 x 25 and 25 x 50mm. All panels are supplied welded to an 8mm wire rod frame, and can be bent and shaped as required.

Vertical bar infilling, consisting of 12mm bars welded to a top and bottom tube, can be raked, radiused and bent to customers' requirements. Alternatively, infill panels - for example, glass or wood - can be attached using the appropriate Kee Klamp fittings.

OTHER PRODUCTS

Kee Klamp Limited also supply and install the following products:

Keeline® - In line handrail system

KeeGuard® - Rooftop guardrail system

Keenect® - Balustrade and handrail system

Kee Lite® - Aluminium Fittings

Kee Anchor® - Mobile man anchor system

Kee Mark™ - Freestanding demarcation system

Kee Dome™ - Freestanding skylight guardrail system

For further information please contact Kee Klamp Limited.

Kee Klamp Limited can provide general guidance on the use of the fittings detailed in this manual. However, the nature of the products means that the ultimate responsibility for selecting the correct fitting for an application rests with the customer.

The customer should also ensure that any existing structure, to which a Kee Klamp construction is being secured, is of sufficient strength to support both the weight of the Kee Klamp construction and the imposed loads applied, including wind loads, snow loads and any other superimposed loads.

SPECIFYING KEE KLAMP FITTINGS

The information contained in this manual includes everything required to produce a full specification.

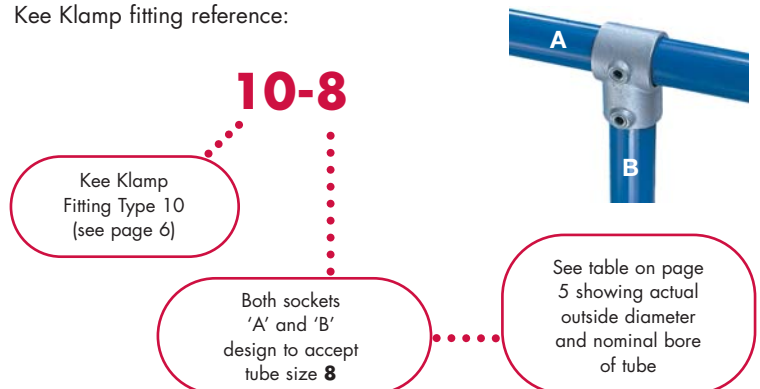
Every fitting is illustrated and accompanied by a table of sizes and weights. Each fitting has a simple numerical code reference, which is unique and differentiates it from every other fitting. The code defines the type of fitting and the tube size, or sizes, it is designed to receive.

The first number, followed by a dash (-) identifies the type of Kee Klamp fitting.

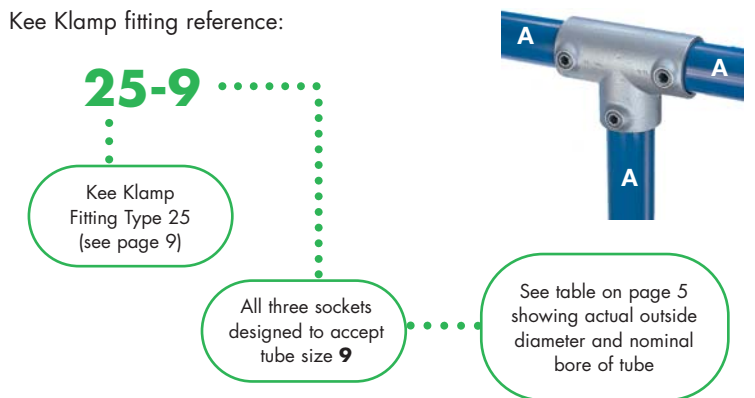
The single digit, following the dash, defines tube size. Two single digits after the dash indicate that the fitting is designed to receive two sizes of tube. The Kee Klamp tube size codes (a choice of eight, numbered from 2-9) are shown on pages 4-5 of this manual, where the Kee Klamp tube code is related to actual tube dimensions (see Table page 5).

Examples

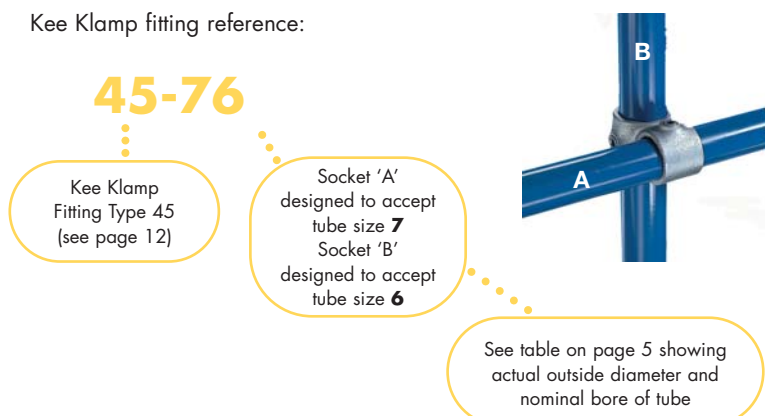
Kee Klamp fitting reference:



Kee Klamp fitting reference:



Kee Klamp fitting reference:



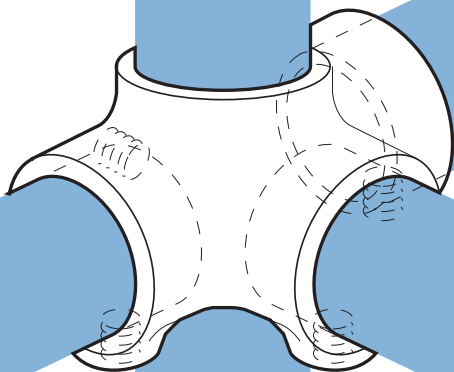
THE KEE KLAMP CONCEPT

THE KEE KLAMP FITTING

The simple but effective engineering principle of the Kee Klamp fitting is the foundation of the most versatile tube connection system available. There are many variations of fitting to suit wide-ranging applications, providing the versatility to achieve virtually any structural configuration.

Kee Klamp fittings are iron castings manufactured to the requirements of BS EN 1562 & 1563. A range of fittings to suit eight sizes of tube is available. A simple hexagon key is the only tool required to create a strong, rigid joint. A recessed set screw, tightened by the hexagon key, firmly locks the tubing into the fitting. The set screw is manufactured in case hardened steel and has Kee Coat® protection against corrosion. This combined with the ThreadKcoat® (patented) factory applied coating for the threaded recesses, ensures that Kee Klamp fittings achieve longer life and better corrosion resistance.

A Kee Klamp fitting (size 5 to 9) can support an axial load of 900 kg per set screw with the set screw tightened to a torque of 4 Kgm (39 Nm or 29 lbs ft). This is normally obtained when the screw is fully tightened using a ratchet wrench.



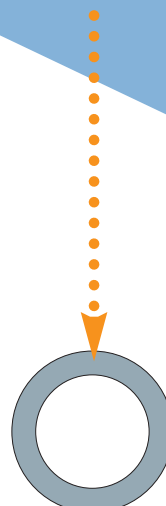
size
2



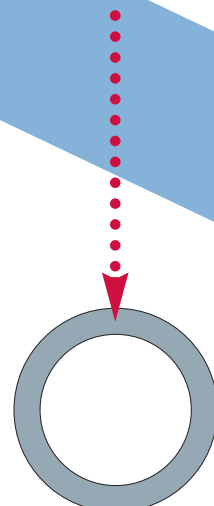
size
3



size
4



size
5



TUBE

Kee Klamp fittings are produced in a range of standard sizes to suit steel tubing to BS EN 10255 (ISO 65), medium and heavy gauge, from 13.5 mm to 60.3 mm outside diameter; also equivalent sizes of tubing in other materials.

Tubing to other specifications can be used, providing the outside diameter is compatible with BS EN 10255 (ISO 65) and wall thickness is not less than 3.2 mm.

Tube sizes are shown in the table and sectional drawings below.

Kee Klamp Tube size	Tube Diameter mm o/d	Nominal Bore mm in
2	13.5	8 1/4"
3	17.5	10 3/8"
4	21.3	15 1/2"
5	26.9	20 3/4"
6	33.7	25 1"
7	42.4	32 1 1/4"
8	48.3	40 1 1/2"
9	60.3	50 2"

* Nominal bore is an arbitrary dimension, because the bore varies with the wall thickness of the tubes.

FINISHES

Kee Klamp fittings are supplied hot dip galvanised to BS EN ISO 1461. Standard steel tube is galvanised to the requirements of BS EN 10255 (ISO 65).

COLOURS

In addition to this standard finish, tube, fittings and accessories can be supplied with polyester coating in any RAL colour.

The polyester coating is highly durable and is usually applied to products that are already galvanised. Should damage occur to the coating, corrosion is still prevented.

Typical examples of available colours are shown on the pages featuring the Kee Klamp standard range of fittings. Colours and illustrative RAL references are presented in the manner as shown below.

• • • RAL 3016 • • •

16

The colours illustrated are for general guidance only and subject to normal variation inherent in the printing process.

size

6

size

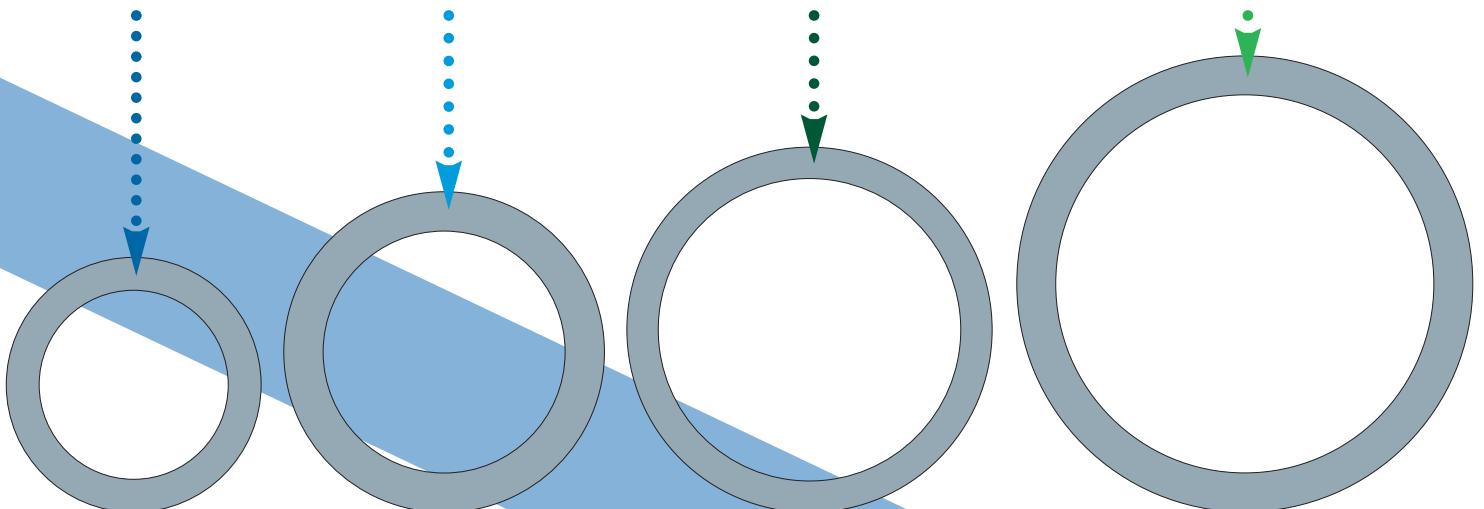
7

size

8

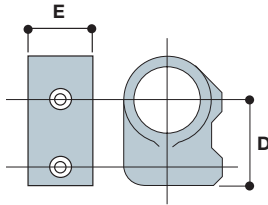
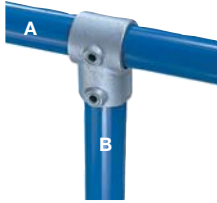
size

9



10

RAL 1001



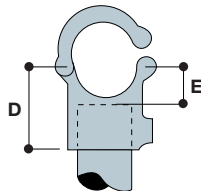
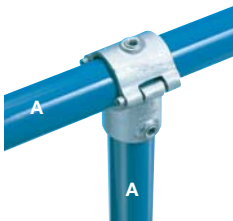
Single Socket Tee

Designed to give a 90 degree butt joint between two tubes. Frequently used for the joint between end uprights and the middle rail on guardrailling where the site is straight and level. Also for base ties on racking. This fitting cannot be used where the tubing through the sleeve 'A' is required to be joined within the Kee Klamp fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
10-2	2	2		25	19					0.02
10-3	3	3		29	25					0.07
10-4	4	4		84	32					0.13
10-5	5	5		41	37					0.23
10-6	6	6		46	47					0.29
10-65	6	5		44	37					0.25
10-67	6	7		55	55					0.43
10-7	7	7		60	55					0.45
10-75	7	5		57	37					0.32
10-76	7	6		57	46					0.43
10-78	7	8		73	60					0.63
10-8	8	8		68	60					0.62
10-87	8	7		63	55					0.50
10-9	9	9		84	73					0.97
10-98	9	8		74	64					0.65

A10

RAL 1006



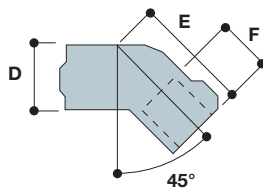
Split Single Socket Tee

The unique "Hinge and Pin" system (patent applied for) of this fitting allows additions or extensions to existing structures without the need for dismantling. Tube must not be joined within the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
A10-7	7			60	28					0.57
A10-8	8			88	33					0.89

12

RAL 2010



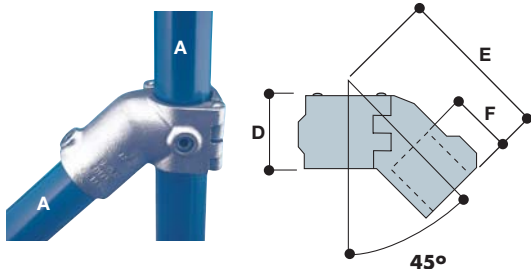
45° Single Socket Tee

Most frequently used for bracing and struts.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
12-5	5			35	72	35				0.30
12-6	6			44	85	35				0.43
12-7	7			55	94	40				0.71
12-8	8			60	108	40				0.92

A12

RAL 6018



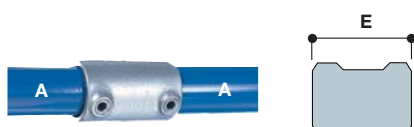
Split 45° Single Socket Tee

The unique "Hinge and Pin" system (patent applied for) of this fitting enables existing structures to be easily extended without the need for dismantling. This fitting is most frequently used for bracing and struts.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
A12-8	8			60	122	52				1.07

14

RAL 3015



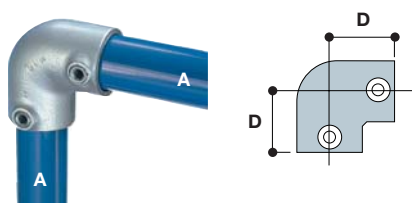
Straight Coupling

Designed to give an in-line joint between tubes of the same size. Where a constant diameter is required along the outside of the tube - eg, for garment storage - an internal spigot should be considered. In this case Type 18 should be used instead of Type 14.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
14-4	4				57					0.14
14-5	5				76					0.27
14-6	6				89					0.39
14-7	7				102					0.52
14-8	8				102					0.64
14-9	9				123					1.08

15

RAL 4006



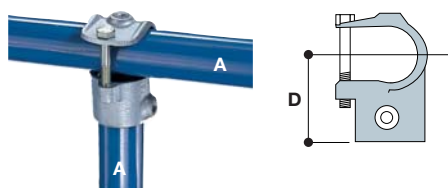
90° Elbow

A 90 degree elbow joint, most frequently used as an end joint for the top rail of guardrailing on a level site.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
15-4	4				34					0.13
15-5	5				41					0.27
15-6	6				46					0.37
15-7	7				60					0.67
15-8	8				68					0.77
15-9	9				85					1.28

16

RAL 3016



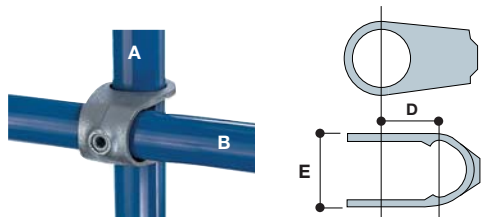
Clamp-on Tee

Widely used for adding to and modifying existing structures. This performs the same function as a Type 10, but because of its open socket it can be added to a complete structure. For alternative fitting, see Type A10. The hex head bolt is for retaining purposes only. Torqued up to 15Nm

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
16-5	5				50					0.29
16-6	6				52					0.33
16-7	7				68					0.59
16-8	8				73					0.60
16-9	9				90					0.92

17

RAL 3003



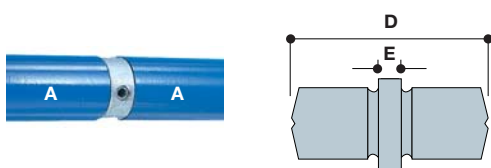
Clamp-on Crossover

Designed to provide a 90 degree cross-over joint. Can be added to an existing structure. Tube should not be joined within this Kee Klamp fitting. For alternative fitting, see Type 45 or Type A45.


TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
17-5	5			27	40					0.15
17-6	6			34	48					0.23
17-7	7			43	58					0.43
17-78	8	7		46	57					0.50
17-8	8			49	65					0.56
17-9	9			61	78					0.90

18

RAL 6019



Internal Coupling

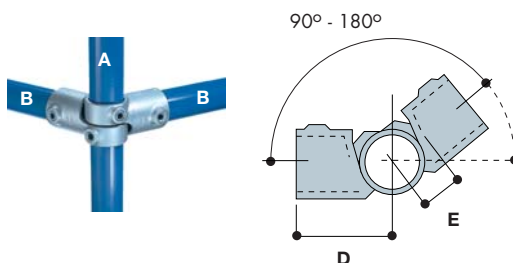
An internal spigot providing a flush joint between two tubes of the same diameter. Not as strong as type 14 and must not be used as a load bearing joint. 

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
18-6	6			76	20					0.26
18-7	7			76	20					0.38
18-8	8			95	20					0.54

Note: This fitting can only be used with tube wall thickness 3.2mm.

19

RAL 6018



Adjustable Side Outlet Tee

Used in pairs to form variable angle joints between 90 degrees and 180 degrees. When calculating cutting lengths for tube, dimension 'E' should be subtracted to give true tube length.

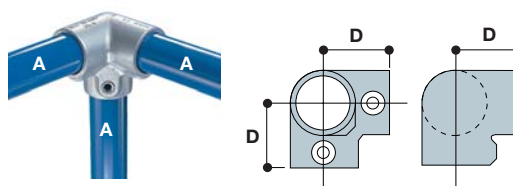
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
19-5	5	5		60	31					0.20
19-6	6	6		58	33					0.29
19-7	7	7		73	40					0.41
19-8	8	8		90	55					0.53
19-85	8	5		73	45					0.65
19-9	9	9		110	49					0.99

Note: Type 19 fittings are normally used in pairs, but are sold and priced separately.

In the case of type 19-8 and 19-85 these fittings can produce an angle range between 60 -180°.

20

RAL 6002



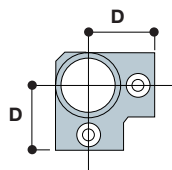
Side Outlet Elbow

A 90 degree corner joint most frequently used for the top rail of guardrailing. It can also be considered for the top corner joint of benches, work tables and other rectangular structures.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
20-4	4			34						0.17
20-5	5			41						0.38
20-6	6			46						0.48
20-7	7			60						0.81
20-8	8			68						1.13
20-9	9			84						1.82

21

• RAL 6004 •



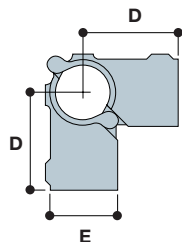
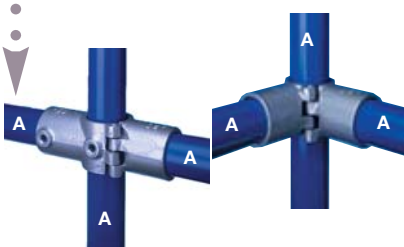
90° Side Outlet Tee

Most frequently paired with Type 20 to give a 90 degree corner joint for the middle rail of guardrailing and other rectangular structures. The upright passes through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
21-4	4			34						0.14
21-5	5			41						0.28
21-6	6			46						0.41
21-7	7			60						0.69
21-8	8			68						0.85
21-9	9			85						1.36

A21/
A26

• RAL 4009 •



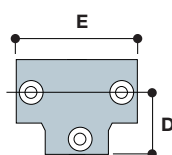
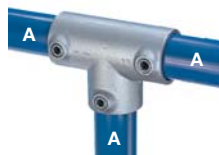
Split Two Socket Cross / 90° Side Outlet Tee

This fitting performs the same function as either Type 21 or Type 26, but because of its unique "Hinge and Pin" system (patent applied for) it can be added to an existing tubular assembly. Type A21/A26 fittings are supplied and priced as a kit including 2 castings and 2 taper pins, which can be assembled in either configuration.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
A21/A26-8	8			88	60					1.17

25

• RAL 4005 •



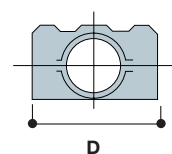
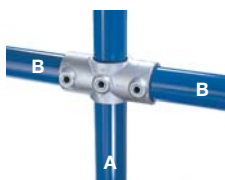
Three Socket Tee

Most commonly used as the 90 degree joint between the top rail and an intermediate upright on guardrailing. As there are two socket set screws in the sleeve, this Kee Klamp fitting can be used where a join is required in the horizontal tube. As an alternative, it is possible to use a Type 10 fitting in its vertical position in place of Type 25, using the latter only where a join in the tubing occurs.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	Ø		
25-4	4			34	67					0.18	
25-5	5			41	82					0.37	
25-6	6			46	92					0.49	
25-7	7			60	120					0.85	
25-8	8			68	136					1.09	
25-9	9			84	168					1.74	

26

• RAL 5012 •



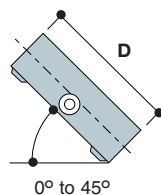
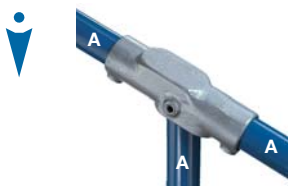
Two Socket Cross

Usually paired with the Type 25 fitting to give a 90 degree joint between the middle rail and an intermediate upright on guardrailing. The upright passes through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
26-4	4	4		68						0.13
26-5	5	5		81						0.27
26-6	6	6		92						0.40
26-7	7	7		120						0.65
26-8	8	8		136						0.85
26-87	8	7		126						0.63
26-9	9	9		172						1.46

27

RAL 5017



Three Socket Custom Tee

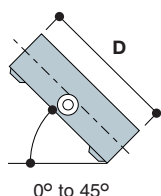
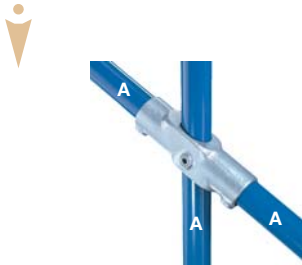
Usually used for guardrailing on a slope, between the top rail and an intermediate upright which is required to remain vertical. These fittings are held in stock as blanks which are machined to individual requirements. **It is therefore, essential that when ordering, the required angle is stated.**

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
27-6	6			159						0.82
27-7	7			190						1.24
27-8	8			216						1.49

Note: When Type 27 fittings are used in pairs (eg, on stairs or ramps), they will not be handed. The set screws on one side will therefore face inwards on the stair or ramp. For an alternative to this fitting, see Type 29. Weights given in the table are for blank fittings. (Refer to page 32).

28

RAL 1001



Two Socket Custom Cross

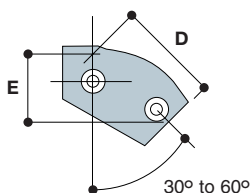
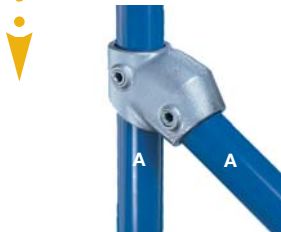
Usually used for guardrailing on a slope, to join the mid rail to an intermediate upright which is required to remain vertical. These fittings are held in stock as blanks which are machined to individual requirements. **It is therefore essential, that when ordering, the required angle is stated.**

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
28-6	6			159						0.82
28-7	7			190						1.24
28-8	8			216						1.49

Note: When Type 28 fittings are used in pairs (eg, on stairs or ramps), they will not be handed. The set screws on one side will therefore face inwards on the stair or ramp. For an alternative to this fitting, see Type 30. Weights given in the table are for blank fittings. (Refer to page 32).

29

RAL 1006



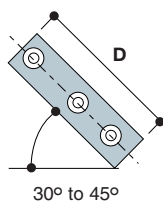
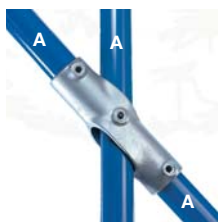
30° to 60° Single Socket Tee

Designed as an alternative to the Type 12 fitting, this adjustable Kee Klamp fitting is most frequently used for struts and braces. It may be used at any selected angle between 30 and 60 degrees. As an alternative, it is possible to use Type 29 in its vertical position in place of Type 27, using Type 27 only where a join in the tubing occurs. (Refer to page 33).

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
29-6	6			73	64					0.44
29-7	7			89	74					0.63
29-8	8			102	68					0.97

30

RAL 2010



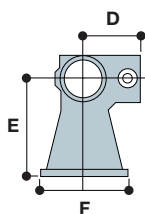
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
30-6	6			146						0.64
30-7	7			178						0.97
30-8	8			216						1.30

30° to 45° Adjustable Cross

Designed as an alternative to the Type 28 fitting, this adjustable Kee Klamp fitting can be used for guardrailing on a slope between the mid-rail and an intermediate upright which is required to remain vertical. It may be used at any selected angle between 30 and 45 degrees. (Refer to page 33).

31

RAL 3015



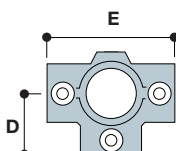
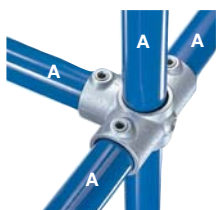
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
31-8	8			76	127	115				2.00

Pallet Flange

This fitting has been designed for the construction of post pallets. Incorporates sockets for the upright and side tubes, and a locating bell for stacking the pallets.

35

RAL 4006



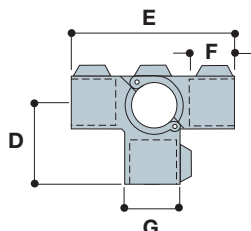
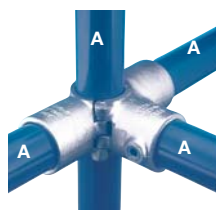
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
35-4	4			34	67					0.20
35-5	5			41	82					0.35
35-6	6			46	92					0.45
35-7	7			60	120					0.77
35-8	8			68	136					1.19
35-9	9			85	170					1.83

Three Socket Cross

Most frequently used to tie uprights with horizontal tubes in three directions, all at 90 degrees to the upright. The upright passes through the fitting.

A35

RAL 2002



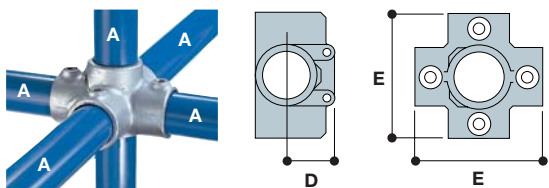
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
A35-8	8			88	176	55	60			1.57

Split Three Socket Cross

The unique "Hinge and Pin" system (patent applied for) of this fitting, enables existing structures to be easily extended without the need for dismantling. This fitting has been designed to tie an upright with horizontal pipes in three directions, all at 90° to the upright. The upright passes through the fitting.

40

RAL 3016



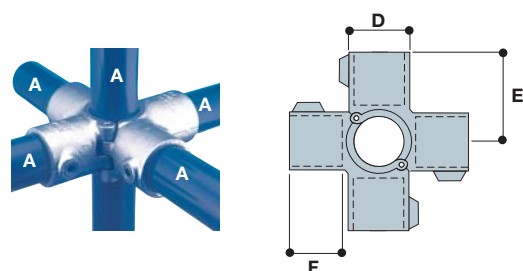
Four Socket Cross

Most frequently used in multiple upright structures, to tie a centre upright with horizontal tubes in four directions. The upright passes through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
40-4	4			34	67					0.27
40-5	5			32	82					0.51
40-6	6			37	92					0.60
40-7	7			43	120					1.05
40-8	8			53	136					1.46
40-9	9			62	168					2.30

A40

RAL 1006



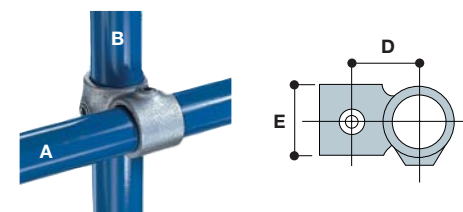
Split Four Socket Cross

The unique "Hinge and Pin" system (patent applied for) of this fitting enables existing structures to be easily extended without the need for dismantling. This fitting is most frequently used in multiple upright structures to tie a center upright with horizontal pipes in four directions. The upright passes through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
A40-8	8			60	88	55				1.96

45

RAL 3003



Crossover

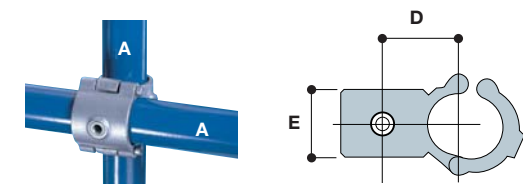
Designed to give a 90 degree offset crossover joint. Frequently used on guardrailing, where, to reduce cost by minimising the tube cuts, a continuous horizontal rail is used. Tube cannot be joined within this Kee Klamp fitting. It may also be used to give intermediate levels on racks, etc, when horizontal ties between uprights across the section are not required.

Note: Where dimension 'E' indicates two figures the first figure refers to socket 'A', the second refers to socket 'B' in the table.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
45-2	2	2		16	19					0.02
45-3	3	3		21	25					0.07
45-4	4	4		25	28					0.15
45-5	5	5		34	31					0.20
45-6	6	6		40	38					0.34
45-65	6	5		36	41/37					0.29
45-7	7	7		55	46					0.54
45-76	7	6		45	46/38					0.45
45-8	8	8		55	50					0.59
45-86	8	6		48	51/38					0.45
45-87	8	7		51	51/46					0.55
45-9	9	9		67	61					0.91
45-98	9	8		60	75/73					1.09

A45

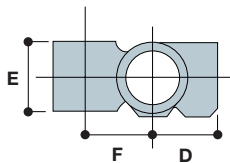
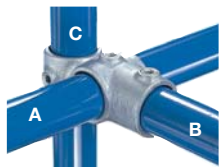
RAL 6019



Split Crossover

The unique "Hinge and Pin" system (patent applied for) of this fitting enables existing structures to be easily extended without the need for dismantling. Designed to give a 90 degree offset crossover joint, tube should not be joined within the fitting.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	Ø		
A45-7	7			49	46						0.65
A45-8	8			55	50						0.79



Combination Socket Tee and Crossover

Used on racking to join horizontal carrying rails to the upright, leaving the socket to take a horizontal tie across the section. For shelved racking it is usual to have the horizontal tube outside the upright. On pallet racking it is preferable to have the carrying rail inside the upright.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
46-4	4	4	4	34	28	25				0.15
46-5	5	5	5	41	31	34				0.30
46-6	6	6	6	46	38	40				0.49
46-7	7	7	7	60	46	49				0.69
46-8	8	8	8	68	51	55				0.91
46-9	9	9	9	85	61	67				1.54

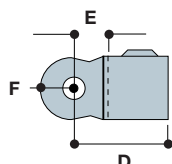
SWIVEL FITTINGS

Types F50, M50, MH50, M51, MH51, M52 and M58

These are known as swivel fittings and can be assembled as Types C50, C51, C52 and C58 or supplied as separate items. They are frequently used for bracing, but can also overcome problems where joints are required at angles other than given by fixed angle fittings.

For economical use of tubing, Types F50, sizes 5-9 only, can be combined with different sizes of M50, MH50, M51, MH51 and M52. Types M50, M51 and M52 can be used to secure various types of infill panel eg, chipboarding, plastic sheeting etc.

Warning: an entire structure should not be constructed from swivel fittings, as these would not provide sufficient stability or rigidity in the structure.



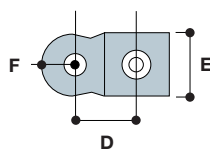
Female Single Swivel Socket Member

One part of a combination fitting. The Type F50, in size 4, has only one ear while Type F50, in sizes 5 through 9, has two ears.

Ø indicates diameter of bolt hole.

Note: Type F50-4 will only mate with a Type M50-4.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
F50-4	4			38	14	11			6.5	0.07
F50-5	5			60	25	19			10	0.28
F50-6	6			60	21	19			10	0.34
F50-7	7			68	21	19			10	0.42
F50-8	8			76	25	19			10	0.52
F50-9	9			83	21	19			10	0.65

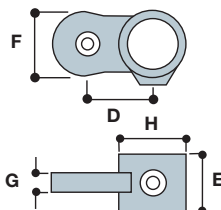


Male Single Swivel Socket Member

One half of a combination fitting. This can also be used for attaching flat panels to tubular structures.

Ø indicates diameter of fixing hole.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
M50-4	4			28	20	11			6.5	0.06
M50-5	5			40	38	19			10	0.24
M50-6	6			43	38	19			10	0.27
M50-7	7			48	38	19			10	0.36
M50-8	8			54	47	19			10	0.36
M50-9	9			62	45	19			10	0.54



Male Single Horizontal Swivel Socket Member

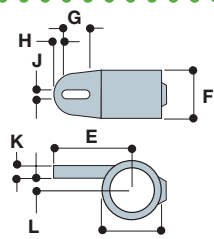
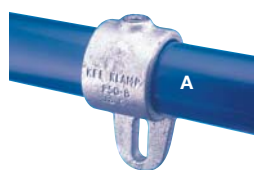
One half of a combination fitting. This can also be used for attaching flat panels to tubular structures.

Ø indicates diameter of bolt hole.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
MH50-6	6			43	38	38	11	46	10	0.30

P50

RAL 6018



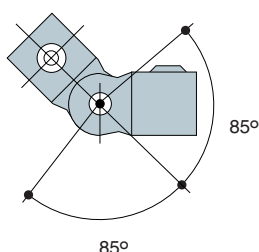
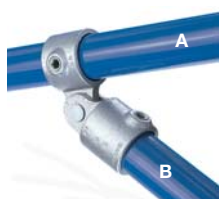
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	J	K	L	
P50-8	8			61	80	47	32	8	10	11	13	0.48

Modified M50-8 With Offset Slot

Designed for the securing of various types of panels and flooring to pipe structures. (i.e. plywood, plastic sheeting, wood planking etc.). This fitting has one offset flange to allow the flush attachment of panels to pipe. Often used with type P51. See also type P57.

C50

RAL 4009



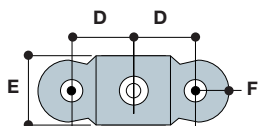
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
C50-44	4	4										0.15
C50-55	5	5										0.56
C50-66	6	6										0.64
C50-77	7	7										0.80
C50-88	8	8										0.91
C50-99	9	9										1.22

Single Swivel Socket

Reducing combinations of Type C50 are available, sizes 5 to 9. See types F50 and M50 for individual fitting specifications.

M51

RAL 4005



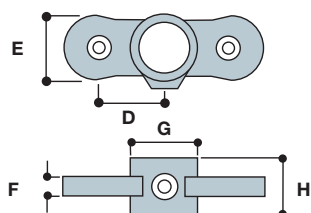
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
M51-5	5			40	38	19			10			0.33
M51-6	6			43	38	19			10			0.38
M51-7	7			48	45	19			10			0.46
M51-8	8			54	45	19			10			0.48
M51-9	9			62	52	19			10			0.71

Male Double Swivel Socket Member

One part of a Type C51 combination fitting. This can also be used for attaching flat panels to tubular structures. Ø indicates diameter of bolt hole.

MH51

RAL 3016



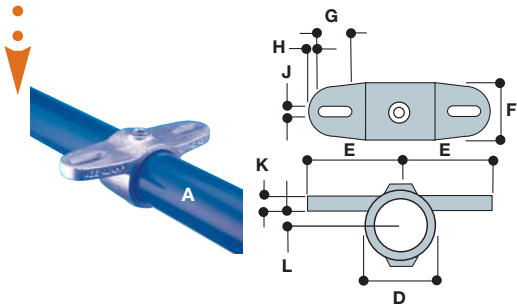
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
MH51-6	6			43	38	11	46	38	10			0.44

Male Double Horizontal Swivel Socket Member

One half of a combination fitting. This fitting can also be used for attaching flat panels to tubular structures. Ø indicates diameter of bolt hole.

P51

RAL 2010



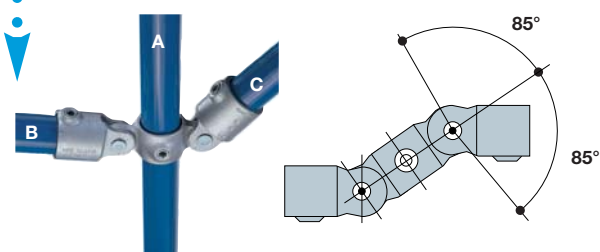
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	J	K	L	
P51-8	8			61	81	47	32	8	10	11	13	0.70

Modified M51-8 With Offset Slots

Designed for the securing of various types of panels and flooring to pipe structures (i.e. plywood, plastic sheeting, wood planking, etc.) This fitting has two offset flanges to allow the flush attachment of panels to pipe. Often used with type P50.

C51

RAL 5012



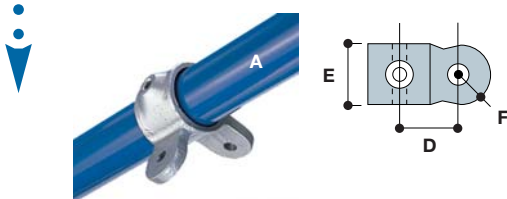
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
C51-555	5	5	5									0.99
C51-666	6	6	6									1.11
C51-777	7	7	7									1.35
C51-888	8	8	8									1.57
C51-999	9	9	9									2.06

Double Swivel Socket

Complete combination swivel fitting. Reducing combinations of Type C51 are available, sizes 5 to 9.

M52

RAL 5017



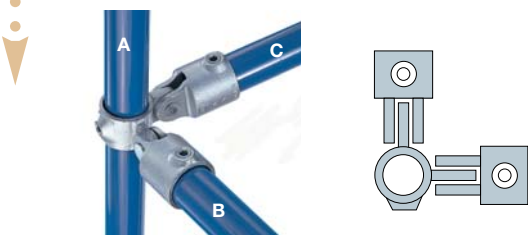
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
M52-5	5			40	38	19			10			0.37
M52-6	6			43	38	19			10			0.39
M52-7	7			50	45	19			10			0.45
M52-8	8			54	47	19			10			0.46

Male Corner Swivel Socket Member

One part of a Type C52 combination fitting. This can also be used for attaching flat panels to tubular structures. Ø indicates diameter of fixing hole.

C52

RAL 1001



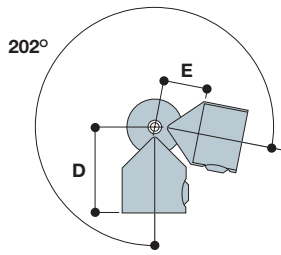
TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	Ø			
C52-555	5	5	5									0.97
C52-666	6	6	6									1.12
C52-777	7	7	7									1.34
C52-888	8	8	8									1.55

Corner Swivel Socket

Complete combination fitting. For individual fitting specifications see Type F50 and Type M52. Reducing combinations of Type C52 are available, sizes 5 to 8.

BC53

RAL 1006



TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
BC53-8	8			83	45					1.14

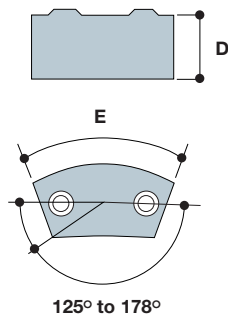
Swivel Elbow

The BC53-8 fitting has been designed as a variable angle in-line connection, adjustable through 202 degrees (Patented).

Warning: an entire structure should not be constructed from BC53-8 or any other swivel fitting, as these would not provide sufficient stability or rigidity in the structure due to free rotation of the fitting.

55

RAL 2010



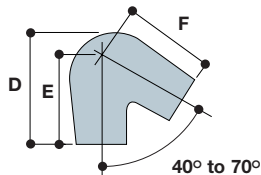
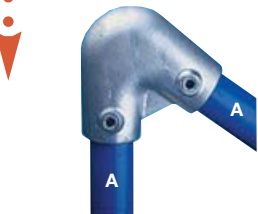
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
55-6	6			46	116					0.51
55-7	7			55	154					0.81
55-8	8			60	153					0.85

Obtuse Angle Elbow

The Type 55 is an ideal fitting to use as an alternative to bending, or when a junction between a sloping tube and an end post is required - eg, guardrailing and staircases. (Refer to page 33).

56

RAL 2002



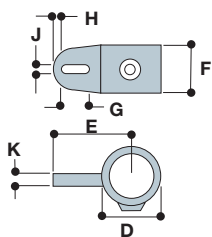
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
56-8	8			134	112	112				1.45

Acute Angle Elbow

Type 56 is an ideal fitting to use as an alternative to bending, or when a junction between a sloping tube and an end post is required - eg, guardrailing and staircases. (Refer to page 33).

P57

RAL 5017



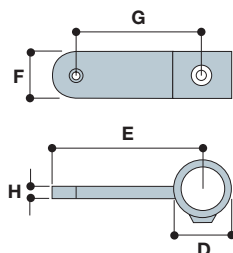
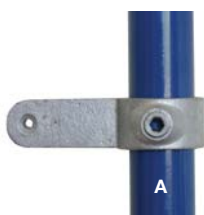
TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	K	
P57-8	8			61	77.5	32	22.5	9	10	11	0.30

Modified M50-8 With Slot

Designed for the securing of various types of panels and flooring to pipe structures (i.e. plywood, plastic sheeting, wood planking, etc.). This fitting has a single offset flange to allow the attachment of panels to pipe. See type P50.

P57E

RAL 5012



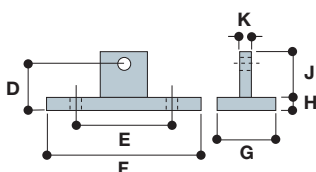
TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
P57E-7	7			55	103	32	86	11		6	0.37

Modified P57

This fitting is similar to the P57-8 but has an elongated offset flange with a fixing hole rather than a slot.

M58

RAL 3015



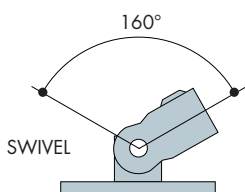
TYPE	Tube ref.			mm							Kg	
	A	B	C	D	E	F	G	H	J	K		Ø
M58				35	84	112	51	6	45	9	11	0.37

Base Plate

This may be considered for various wall and brace fixings, usually combined with Type F50 to give an adjustable angle fitting Type C58. Ø indicates diameter of holes in fixing base plate. The diameter of the attachment bolt hole is 10mm.

C58

RAL4006



TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	Ø		
C58-5	5									0.70	
C58-6	6									0.76	
C58-7	7									0.84	
C58-8	8									0.94	
C58-9	9									1.07	

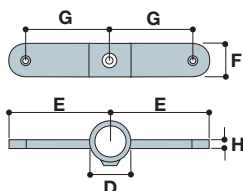
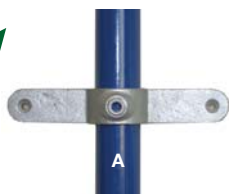
Swivel Flange

A swivel fitting for attachment of angled tubing to a flat surface. For dimensions refer to Type F50 and Type M58.

Warning: it is not recommended for use as a base flange to support guardrailing, balustrading or other types of structure.

P58

RAL 6002



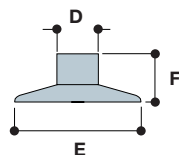
TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
P58-7	7			55	103	32	86	11		6	0.56

Double Central Flange Fitting

This fitting is designed for securing various types of panels and flooring to tubular structures. It has central flanges with fixing holes.

59

RAL 3016



Spigot Flange

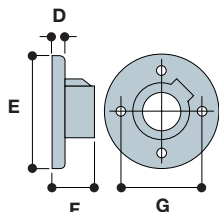
A spigot flange which fits inside the tube and is not secured by a socket screw. Type 59 can only be used with tube wall thickness of 3.2mm and in light self supporting structures. Type 59 is manufactured in aluminium.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
59-5	5			19	79	28				0.11
59-6	6			26	87	32				0.12
59-7	7			33	98	35				0.20
59-8	8			38	103	41				0.28

Note: No fixing holes are provided in this fitting.

60

RAL 3003



Extra Heavy Flange

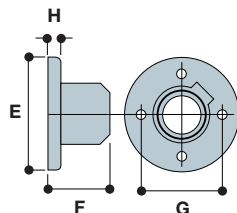
A heavy duty flange, with wide base, for spreading loads over a large surface area. This flange, with holes provided for countersunk head screw fixings only, is for use on structures where the fixing required is positional only. Frequently used as a wall fixing bracket. Ø indicates diameter of fixing holes.

Warning: it is not recommended for use as a base flange to support guardrailing, balustrading or other types of structure.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
60-5	5			14	130	64	79		8	1.15
60-6	6			14	140	64	86		8	1.15
60-7	7			14	149	64	95		8	1.30
60-8	8			14	156	64	102		8	1.48

61

RAL 6019

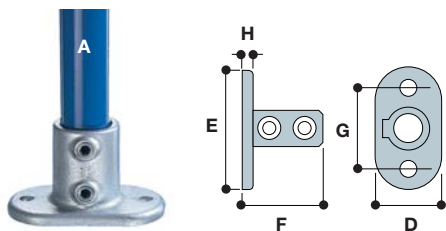


Flange

This flange, with holes provided for countersunk head screw fixings only, is used on structures where the fixing required is positional only. Frequently used as a wall fixing bracket. (Refer to page 35). Ø indicates diameter of fixing holes.

Warning: it is not recommended for use as a base flange to support guardrailing, balustrading or other types of structure.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
61-3	3				70	32	47	6	6.5	0.19
61-4	4				76	39	54	6	6.5	0.23
61-5	5				80	40	57	6	6.5	0.33
61-6	6				90	48	64	6	6.5	0.50
61-7	7				102	51	76	7	6.5	0.62
61-8	8				114	59	89	8	6.5	0.67
61-9	9				127	63	95	10	10	1.08

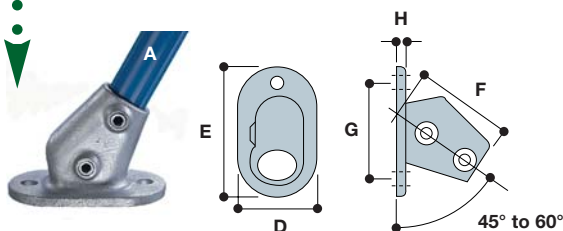


Standard Railing Flange

Ideal when a structural fixing is required. Type 62 should always be used to fix down guardrailing and balustrades. The holes are of sufficient diameter (\varnothing) to give a good fixing with either a mechanical or chemical anchor. The two socket set screws in the vertical socket give greater stability to the upright. It is recommended that the fixing holes in the flange should be in line with the applied load.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
62-2	2			32	64	38	44	5	9	0.04
62-5	5			64	116	76	76	8	11	0.59
62-6	6			76	128	89	89	8	14	0.73
62-7	7			75	140	89	102	10	14	1.3
62-8	8			85	155	89	115	10	14	1.3
62-9	9			102	165	127	127	10	18	1.76

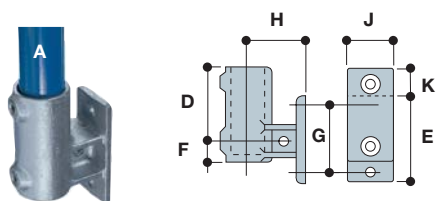
Note: The Type 62-7 and Type 62-8 fittings have been especially designed to comply with the 100mm sphere rule as defined in BS 6180 and Building Regulations, in the design of balustrade systems.



Angle Base Flange

This fitting is similar to Type 62, but is used to set up the upright at an angle between 45 degrees to 60 degrees. This fitting should only be subjected to light loads due to its size and the base fixing holes, which cannot be positioned at 90 degrees to the applied load for normal staircase and ramp guardrail applications. For greater loads or other tube sizes, a Type 62 flange is used and the upright bent to the required angle. \varnothing indicates diameter of fixing holes.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
63-6	6			76	127	92	95	8	14	0.04
63-7	7			76	138	95	106	10	14	0.59
63-8	8			89	155	100	115	10	14	0.73



Standard Vertical Railing Base

This fitting is designed for palm fixing guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket.

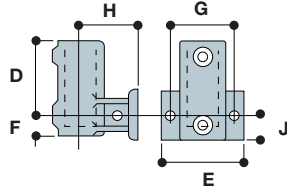
Access to the top fixing hole is restricted by the position of the flange to the barrel. When selecting a hexagon head bolt or similar bolt fixing, the maximum length of the bolt including the head must not exceed 25mm. (Refer to Table page 35).

TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	J	K	\varnothing	
64-6	6			86	95	22	67	57	45	39	14	0.77
64-7	7			84	108	30	89	64	50	30	14	1.12
64-8	8			89	121	32	89	70	58	28	14	1.54

Note: Should an upright be required to pass through the fitting, the base can be bored out to order.

65

RAL 4005



Standard Horizontal Railing Base

This fitting is designed for palm fixing guardrailing and balustrading to walls, parapets, steps and ramps. Only available in size 6. The upright cannot drop through the socket.

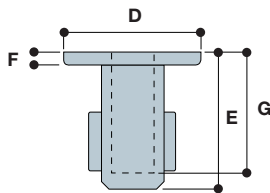
Ø indicates diameter of fixing holes.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
65-6	6			83	96	22	67	57	22	14	0.76

Note: Should an upright be required to pass through the fitting, the base can be bored out to order.

66

RAL 5012



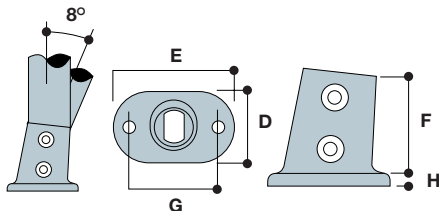
Ground Socket

A ground socket fitting for use when uprights are required to be removable. It incorporates a socket set screw fixing and can be supplied with a plug to fill the hole when the tube is removed.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
66-6	6			127	122	10	115				1.87
66-7	7			140	135	10	127				2.32
66-8	8			140	135	10	127				2.50

67

RAL 1001



Angle Flange

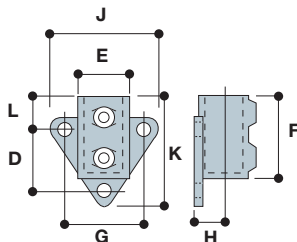
Type 67 has been designed to allow the upright to pivot in the barrel, providing an angular displacement from 3 degrees up to a maximum of 11 degrees, measured from the vertical. Ideal to secure balustrade and guardrail systems on access ramps or other types of slopes.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
67-7	7			83	140	79	102	10	14	1.13
67-8	8			96	155	80	115	10	14	1.3

Note: It is generally recommended that when installing the 67-8, the fixing holes (Ø) in the base should be in-line with the applied load.

68

RAL 1006

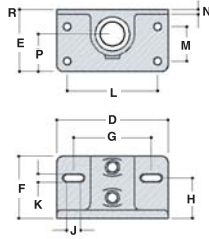


Wall Flange

Side palm fixing for guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket.

TYPE	Tube ref.			mm									Kg
	A	B	C	D	E	F	G	H	J	K	L	Ø	
68-6	6			63	45	77	71	24	96	88	25	11	0.62
68-7	7			72	55	83	83	28	108	99	25	11	0.80
68-8	8			78	60	89	86	31	111	103	25	11	0.95

Warning: if the upright is required to pass through the fitting by machining out the base stop, the bottom fixing hole (Ø) will be unusable.



Railing Flange With Toeboard Adaptor

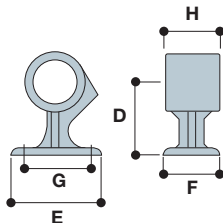
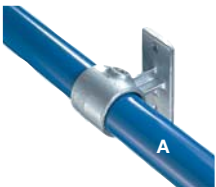
The type 69 fitting has been designed for guardrailing and balustrading applications and provides the added benefit of attaching a toeboard to the base.

The base plate holes are of sufficient diameter to allow for attachment with either a mechanical or chemical anchor, the side plates have slotted holes to allow for a degree of sideways movement for ease of installation.

TYPE	Tube ref.			mm				
	A	B	C	D	E	F	G	H
69-6	6			130	75	89	95	58
69-7	7			145	80	90	97	58
69-8	8			160	90	90	112	58

TYPE	mm								Kg
	J	K	L	M	N	P	R	Ø	
69-6	15	10	100	35	7	45	25	11	1.72
69-7	20	10	115	40	7	47	25	11	1.90
69-8	20	10	130	50	7	54	25	11	2.30

Ø indicates diameter of fixing holes.

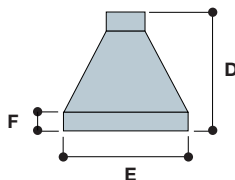


Rail Support

This fitting, with holes (Ø) provided for countersunk head screw fixings only, is designed to carry handrails along walls or to fix structures back to walls. The tube passes through the fitting and cannot be joined within the fitting. Type 70 is also used to attach kicking boards to the base of guardrail uprights.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
70-5	5			54	76	46	57	38	8	0.36
70-6	6			58	88	40	70	38	8	0.44
70-7	7			64	102	45	82	45	8	0.56
70-8	8			70	108	52	82	58	8	0.78

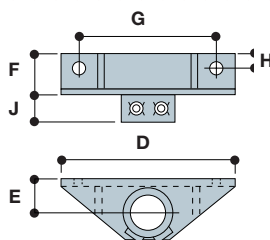
Warning: Type 70 fittings are not to be used as Base Flanges for Full Height Guardrails



Weather Cap

Type 71 is a weather cap designed for roof guardrailing to ensure a watertight seal for base fixing flanges. The weather cap is secured to the upright by means of a combined sealant and adhesive available from Kee Klamp Limited. A separate information sheet detailing fixing instructions is available on request.

TYPE	Tube ref.			mm					Kg
	A	B	C	D	E	F	G	H	
71-6	6			125	143	25			0.24
71-7	7			150	154	25			0.32
71-8	8			155	167	25			0.36



Stair Tread Support

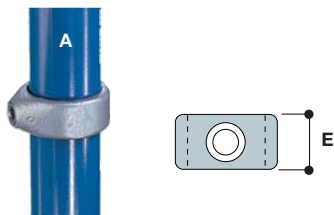
Type 72 is a stair tread support suitable for most types of stair tread, including timber, open steel and chequer plate. Fixing of the treads is by two bolt holes (Ø) in each fitting.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
72-8	8			203	39	51	153	20	33	12	1.25

Warning: if Type 72 fittings are to be used for a permanent application or subjected to high loads, the stair tread support tube which is located at its ends with a single grub screw, should be drilled and pinned to avoid rotational slip.

75

RAL 4006



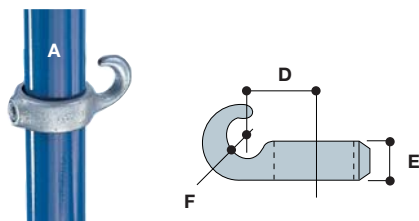
Collar

A collar commonly used to support another Kee Klamp fitting if the latter is required to be left untightened, eg, on gate hinges. Type 75 is also useful when the loading on a structure exceeds the maximum permitted slip load for a socket set screw, as it gives extra support.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
75-4	4				22					0.05
75-5	5				25					0.13
75-6	6				26					0.13
75-7	7				25					0.15
75-8	8				25					0.19

76

RAL 3016



Hook

A fitting normally used for attachment of chains.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
76-5	5			28	25	28				0.17
76-6	6			35	25	13				0.21
76-7	7			40	25	40				0.23
76-8	8			41	25	13				0.24

77

RAL 3003



Plastic Plug

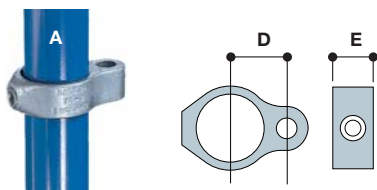
A grey plastic plug to fit open ended tubes. See also fitting Type 84.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
77-4	4									0.001
77-5	5									0.004
77-6	6									0.007
77-7	7									0.016
77-8	8									0.02
77-9	9									0.025

Note: Suitable for medium and heavy tubing only.

78

RAL 6019



Eye Fitting

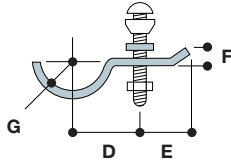
A fitting used in conjunction with Type 83 fitting for gate hinges.

Ø indicates diameter of pivot hole.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
78-5	5			30	25				14	0.21
78-6	6			33	26				14	0.25
78-7	7			38	26				14	0.26
78-8	8			41	26				14	0.28

79

RAL 6018



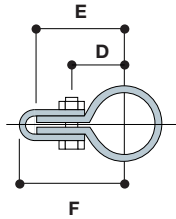
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
79-7	7			46	34	8	21		8	0.08

Sheeting Clip

This fitting is used to attach profiled sheeting material to Kee Klamp tube. The fitting is supplied with a hexagonal head M6 x 50mm bolt, a sealing washer and nut.

81

RAL 6002



TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
81-5	5			24	39	56			7.5	0.07
81-6	6			27	42	59			7.5	0.08
81-7	7			32	47	64			7.5	0.08
81-8	8			34	49	66			7.5	0.09
81-9	9			40	55	72			7.5	0.10

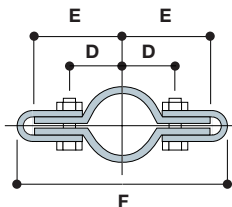
Single Sided Clip

Single clips for attaching wiremesh infilling. For economy it is possible to use Type 81 clips without the safety attachment, to secure various types of infill panels (plyboard, perspex etc) up to a thickness of 10mm. All clips are supplied with hexagonal head fixing bolts, M6 x 35mm long, and nut.

Note: For D and E dimensions the figures given are for the respective minimum and maximum dimensions allowed by the slotted nature of the holes.

82

RAL 6004



TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
82-5	5			24	39	112			7	0.11
82-6	6			27	42	118			7	0.12
82-7	7			32	47	128			7	0.13
82-8	8			34	49	132			7	0.14
82-9	9			40	55	144			7	0.14

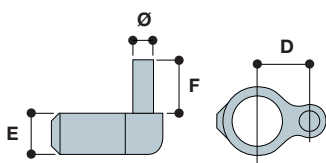
Double Sided Clip

Double clips for attaching wiremesh infilling. For economy it is possible to use Type 82 clips without the safety attachment, to secure various types of infill panels (plyboard, perspex etc.) up to a thickness of 10mm. All clips are supplied with hexagonal head fixing bolts, M6 x 35mm long, and nut.

Note: For D and E dimensions the figures given are for the minimum and maximum tolerances allowed by the slotted nature of the holes.

83

RAL 4009



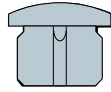
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
83-5	5			30	26	38			13	0.20
83-6	6			33	25	38			13	0.25
83-7	7			38	25	38			13	0.29
83-8	8			41	26	38			13	0.30

Pin Fitting

This fitting is used in conjunction with Type 78 for gate hinges.

84

RAL 4005



Malleable Plug

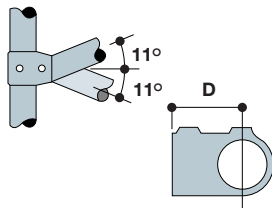
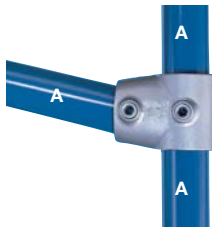
A metal drive-in plug which is difficult to remove when installed. For an alternative in plastic, see Type 77.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
84-5	5									0.05
84-6	6									0.10
84-7	7									0.12
84-8	8									0.17
84-9	9									0.29

Note: This fitting can only be used with EN 10255 (ISO 65) medium weight tubing.

86

RAL 5012



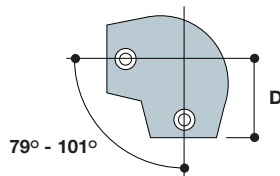
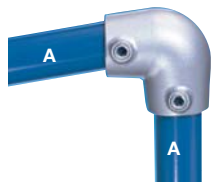
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
86-7	7			60						0.55
86-8	8			68						0.76

Angle Tee

Used to join the middle rail to an end upright on a guardrail on a slope of up to eleven degrees. This fitting cannot be used to join the tube within the fitting.

87

RAL 5017



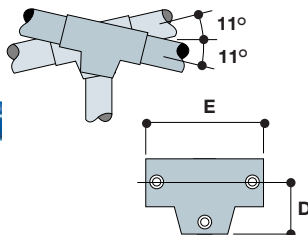
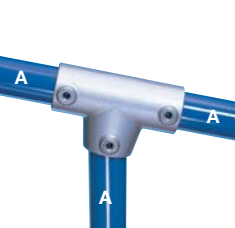
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
87-7	7			60						0.80
87-8	8			68						0.90

Angle Elbow

Used to join the top rail to an end upright on a guardrail on a slope of up to 11 degrees at both top and bottom of the run.

88

RAL 1001



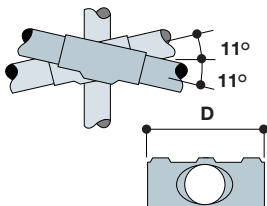
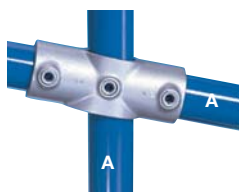
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
88-7	7			60	144					1.02
88-8	8			68	158					1.24

Three Socket Angle Tee

Used to join the top rail to an intermediate upright on a guardrail on a slope of up to 11 degrees. As there are two socket set screws in the sleeve, this Kee Klamp fitting can be used to join two ends of rail.

89

RAL 1006



TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
89-7	7			144						0.90
89-8	8			158						0.93

Two Socket Angle Cross

Used to join the middle rail to an intermediate upright on a guardrail on a slope of up to 11 degrees. The upright passes through the fitting.

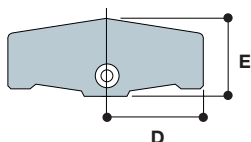
THE 90 RANGE

These are known as Pedestrian Guardrail (PGR) fittings and are used as an alternative to Types 10, 15, 25 and 26 when the site is not straight and level. There is sufficient play within the Kee Klamp fitting to negotiate a slope up to 7 degrees or a radius greater than 6

metres, when the uprights are at 2 metre centres, using straight tubing. They also allow damaged rails to be removed without dismantling the adjacent structure, which is a requirement of BS 7818. Only available in size 8. (Refer to page 35).

90

RAL 2010



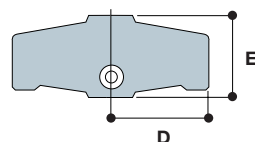
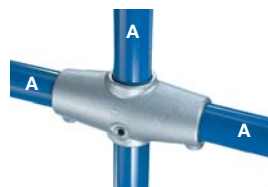
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
90-8	8			99	88					1.77

PGR Three Socket Tee

Type 90 is used to join the top rail to an intermediate upright.

91

RAL 2002



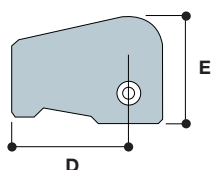
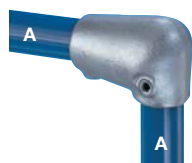
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
91-8	8			99	89					1.80

PGR Two Socket Cross

Type 91 is used to join the mid rail to an intermediate upright.

92

RAL 3015



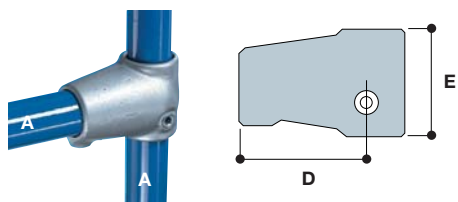
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
92-8	8			99	89					1.29

PGR Elbow

Type 92 is used to join the top rail to an end post.

93

RAL 4006



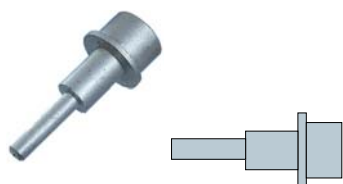
TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
93-8	8			99	89					1.20

PGR Tee

Type 93 is used to join the mid rail to an end post.

95

RAL 3016



TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
95-8	8									0.46

PGR Internal Spigot

Internal spigot designed to prevent sagging of bends when using the 90 range of fittings. Refer to page 35 for further information.

Warning: this spigot can only be used with BS1387 medium weight tubing or equivalent.

97

RAL 3003



Set Screws

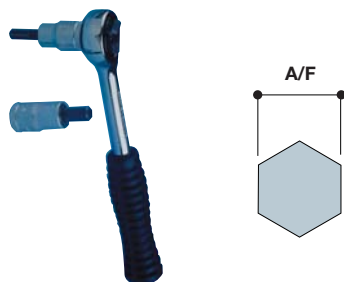
Socket set screws are supplied in all Kee Klamp fittings as standard.

Kee Koat®II, applied as standard throughout the Kee Klamp range, provides the set screws with up to four times the corrosion resistance of Bright Zinc Plating.

TYPE	Tube ref. A	
97-2	2	5/16" BSF
97-3	3	5/16" BSF
97-4	4	3/8" BSF
97-5	5	ISO 228 1/4"
97-6	6	ISO 228 1/4"
97-7	7	ISO 228 3/8"
97-8	8	ISO 228 3/8"
97-9	9	ISO 228 3/8"

98

RAL 6019



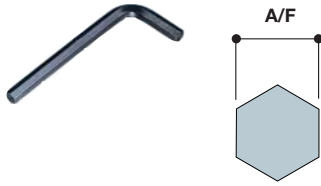
Ratchet Handle (1/2" Drive, 8" Long)

New, improved design, reversible ratchet for easier fastening of grub screws. Ratchet Handle and Hexagon Bits are supplied separately.

TYPE	Tube ref. A	
98		Ratchet Handle (1/2" Drive, 8" Long)
98-5	5	Hexagon Bit (1/4" AF)
98-6	6	Hexagon Bit (1/4" AF)
98-7	7	Hexagon Bit (5/16" AF)
98-8	8	Hexagon Bit (5/16" AF)
98-9	9	Hexagon Bit (5/16" AF)

99

RAL 6018



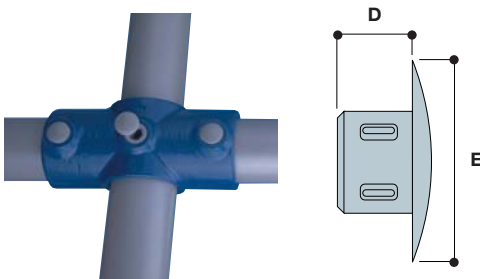
Hex Key

The only tool needed to operate the Kee Klamp fitting is a simple hexagon key.

TYPE	Tube ref.	
	A	
99-2	2	5/32" A/F across flats
99-3	3	5/32" A/F across flats
99-4	4	3/16" A/F across flats
99-5	5	1/4" A/F across flats
99-6	6	1/4" A/F across flats
99-7	7	5/16" A/F across flats
99-8	8	5/16" A/F across flats
99-9	9	5/16" A/F across flats

100

RAL 6002



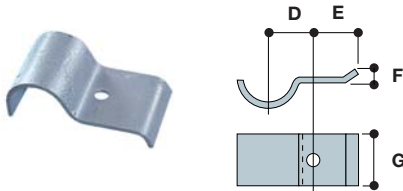
Plastic Set Screw Cap

Grey plastic grubscrew caps provide the perfect finishing touch to galvanised Kee Klamp fittings. Secure push-in-fit application.

TYPE	Tube ref.			mm		
	A	B	C	D	E	
100-5	5			6	16	to fit 97-5 set screw
100-6	6			6	16	to fit 97-6 set screw
100-7	7			6	16	to fit 97-7 set screw
100-8	8			6	16	to fit 97-8 set screw
100-9	9			6	16	to fit 97-9 set screw

105

RAL 6004



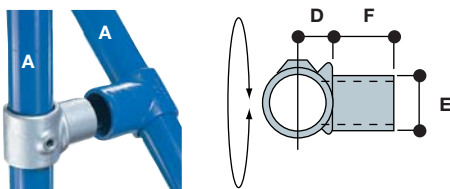
Sheeting Clip w/o hardware

This fitting is used to attach profiled or flat sheeting. It is not supplied with fixings.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
105-6	6			32	38	13	50	9		0.14
105-7	7			38	40	13	50	9		0.16
105-8	8			40	40	13	50	9		0.18
105-9	9			48	40	13	50	9		0.23

114

RAL 4009



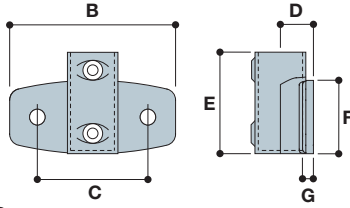
Swivel Tee

An internal swivel fitting, designed to accommodate varying angles on handrailing to staircases, ramps, or bracing. Used in conjunction with Types 10, 15, 25 or 45 it eliminates the need for specially drilled angle fittings Type 27 and Type 28.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
114-2	2			11	13	21				0.02
114-6	6			23	33	29				0.36
114-7	7			27	42	36				0.54
114-8	8			30	49	41				0.64

115

RAL 4006



Horizontal Railing Base

This fitting is designed for palm fixing guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket.

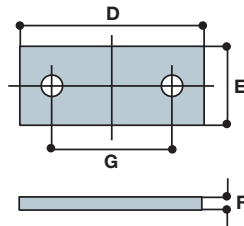
10mm thick packing spacers are available, as extras, if required.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
115-6	6	150	100	30	90	65	10		14	1.08
115-7	7	150	100	35	90	65	10		14	1.23
115-8	8	150	100	41	90	65	13		14	1.42

Note: Should an upright be required to pass through the fitting, the base can be bored out to order.
Ø indicates diameter of fixing holes.

S115

RAL 3015



Packer Plate for Type 115

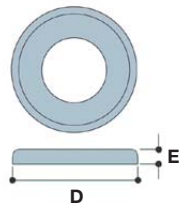
Type S115 allows the Type 115 fitting to be positioned in channels, slots and other offset areas.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
S115				150	65	12	100			14	0.87

Note: Ø indicates diameter of fixing holes.

118

RAL 3016



Cover Flange

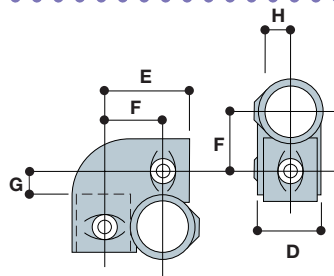
The Cover Flange slips over uprights to finish below ground post installations.

The fitting is secured to the upright pipe with a single recessed grub screw.

TYPE	Tube ref.			mm							Kg
	A	B	C	D	E	F	G	H	J	Ø	
118-8	8			100	15						0.40

121

RAL 4005



Corner Crossover

This fitting is designed to provide a 90 degree offset corner joint.

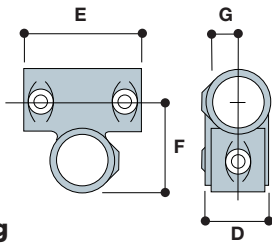
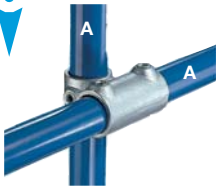
When calculating the cutting lengths for tube, dimension 'G' should be subtracted to give the tube length for the rails and dimension 'H' should be added to give the tube length for the upright.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
121-7	7			55	72	49	22	28		0.92

Note: To obtain the true height of the upright the allowance for base fittings must be included.

145

RAL 5012



Crossover Coupling

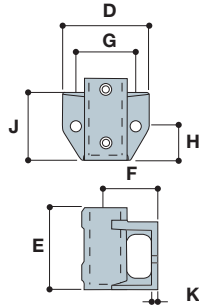
This fitting is designed to give a 90 degree offset crossover. As there are two socket set screws in the sleeve, this Kee Klamp fitting can be used where a join is required in the horizontal tube. For economy, it is possible to use a Type 45 in place of the 145, using the 145 only where a join in the tubing occurs. When calculating the cutting lengths for tube, dimension 'G' should be added to give the tube length for the upright.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
145-7	7			55	102	49	23			0.83

Note: To obtain the true height of the upright the allowance for base fittings must also be included.

265

RAL 3003



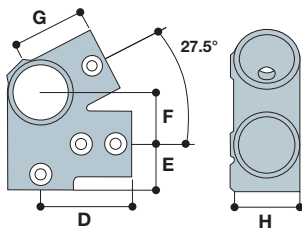
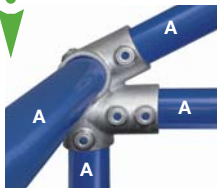
Offset Railing Base

The Type 265 fitting is designed for palm fixing guardrailings and balustrading to walls, parapets steps and ramps. The fitting has been designed with an offset barrel to enable clearance of overhangs and cappings.

TYPE	Tube ref.			mm								Kg
	A	B	C	D	E	F	G	H	J	K	Ø	
265-7	7			110	104	66	76	43	86	8	14	1.35
265-8	8			124	119	74	94	43	86	8	14	1.58

350

RAL 6018



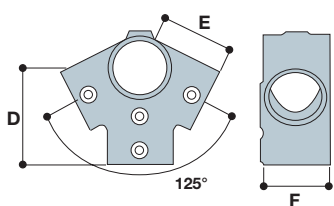
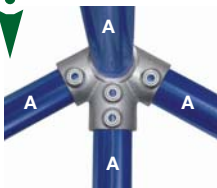
Eaves Fitting

This fitting is designed to provide the "eaves" to a roof type of structure. The horizontal tube can pass through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
350-8	8	8	8	83	42	47	67	60		1.19

351

RAL 6002



Ridge Fitting

This fitting is a four way socket designed to provide the ridge to a roof style of structure. The tube at the apex can pass through the fitting.

TYPE	Tube ref.			mm						Kg
	A	B	C	D	E	F	G	H	Ø	
351-8	8	8	8	89	67	60				0.96

Kee Klamp

Safety Barrier Systems

Simple to Design and Specify

The modular Kee Klamp System securely joins standard sizes of Structural Steel Tube in almost any configuration you can imagine.

Assembled on site, Kee Klamp Guardrailing will accommodate most variations between design drawings and site requirements.

Cost Effective To Install

Low skill, No Welding, No Special Tools Required. All Fittings slip over tube and can be adjusted to the required level and positioned before tightening with a simple Hex Key.

Widest Range of Fittings for Structural Tube

Just sketch out the Guardrail you want to construct and check the fittings you require

Combination fittings optimise the strength to weight ratio and cost of any structure, enabling different diameters of tube to be used.

Meet Specified Loadings Up to 1500 Newtons/ Metre

Use the Loadings Table opposite to select the appropriate Tube Size and Grade and the "Bay Size" for the Guardrailing Uprights.

The same Design Loading can be achieved by using either stronger uprights and wider bays, or lighter uprights set closer together.

Unrivalled Technical Support Services

Kee Klamp Limited offer practical assistance and advice by phone and fax. Our technical teams can check your designs or drawings for compliance with specific standards

Kee Klamp Technical Support

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Fax +44 (0) 118 9311146

E-mail sales@keeklamp.com

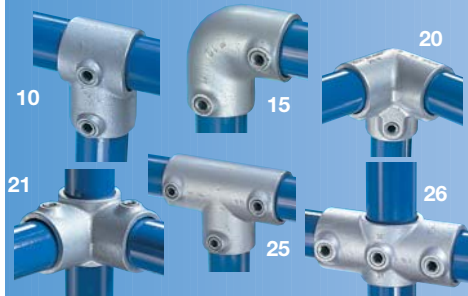
www.keeklamp.com

Meet Every Safety Loading Standard Up To 1500 Newtons Per Metre In Practically Every Location

IN LINE CONSTRUCTION

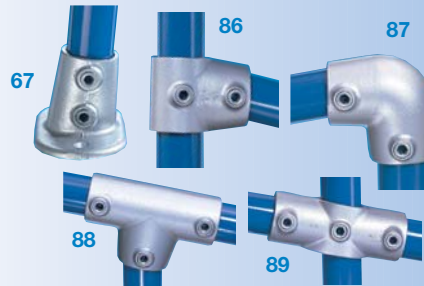
Level

The universal guardrailing solution.



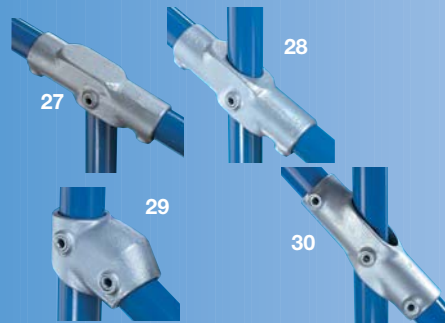
Ramps

Unique 0 to 11° range for in-line construction. Non-Handed fittings allow consistent alignment of grub screws.



Stairs

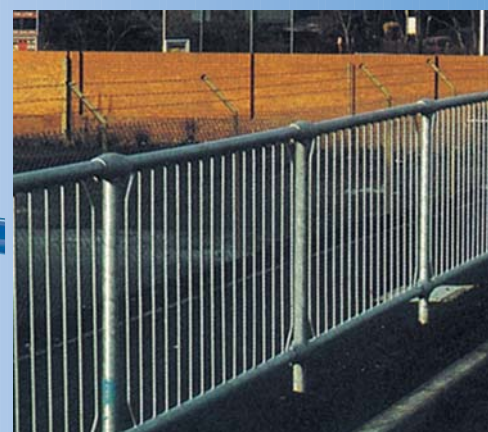
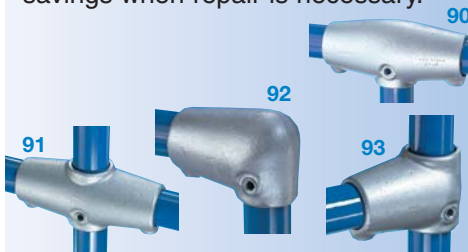
Maximum Strength. Minimum installation time and cost.



Pedestrian Guardrailing

Complies with BS7818 Clause 2.4.

Each railing is individually replaceable offering large cost savings when repair is necessary.



Meeting Safety Standards

- 360 Newtons per metre run (N/m)** - Industrial Use -Non Emergency
740 Newtons per metre run (N/m) - Commercial Use
1500 Newtons per metre run (N/m) - Retail/Public Access

The current regulations give various design requirements to be fulfilled of which the Design Load is the most important.

Selection of Guardrail Uprights - Maximum Distance Apart Bay Size for Given Heights of Railing and Design Load

UPRIGHT CENTRES USING TYPE 62 BASE

Based upon Rail diameter being the same as the upright but using BS EN 10255 medium wall tubing
 Design loads are as stated in BS 8118, BS 6180, BS 6399 & BS 7818

Tube Size	6 3.2 mm	7 3.2 mm	7 4 mm	8 3.2 mm	8 4 mm	8 5 mm	9 3.65 mm	9 4.5 mm
Grade	BS EN 10255 Medium	BS EN 10255 Medium	BS EN 10255 Heavy	BS EN 10255 Medium	BS EN39	EN 10210 S355 JOH	BS EN 10255 Medium	BS EN 10255 Heavy
Design Load Criteria	Upright Height 900mm							
360 N/M	814 mm (4.44 KN)	1369 mm (6.52 KN)	1595 mm (7.60 KN)	1828 mm (7.73 KN)	2584 mm (10.92 KN)	3052 mm (12.90 KN)	3265 mm (13.80 KN)	3856 mm (14.75 KN)
740 N/M	396 mm (4.44 KN)	666 mm (6.52 KN)	776 mm (7.60 KN)	889 mm (7.73 KN)	1257 mm (10.92 KN)	2229 mm (19.36 KN)	1588 mm (13.80 KN)	1876 mm (14.75 KN)
1500 N/M	195 mm (4.44 KN)	329 mm (6.52 KN)	383 mm (7.60 KN)	439 mm (7.73 KN)	620 mm (10.92 KN)	1100 mm (19.36 KN)	784 mm (13.80 KN)	925 mm (14.75 KN)
Design Load Criteria	Upright Height 1000mm							
360 N/M	732 mm (4.44 KN)	1232 mm (6.52 KN)	1435 mm (7.60 KN)	1645 mm (7.73 KN)	2326 mm (10.92 KN)	2930 mm (13.76 KN)	2939 mm (13.80 KN)	3470 mm (14.75 KN)
740 N/M	356 mm (4.44 KN)	599 mm (6.52 KN)	698 mm (7.60 KN)	800 mm (7.73 KN)	1131 mm (10.92 KN)	2006 mm (19.36 KN)	1430 mm (13.80 KN)	1688 mm (14.75 KN)
1500 N/M	176 mm (4.44 KN)	296 mm (6.52 KN)	345 mm (7.60 KN)	395 mm (7.73 KN)	558 mm (10.92 KN)	990 mm (19.36 KN)	705 mm (13.80 KN)	833 mm (14.75 KN)
Design Load Criteria	Upright Height 1100mm							
360 N/M	666 mm (4.44 KN)	1120 mm (6.52 KN)	1305 mm (7.60 KN)	1496 mm (7.73 KN)	2114 mm (10.92 KN)	2778 mm (14.35 KN)	2671 mm (13.80 KN)	3155 mm (14.75 KN)
740 N/M	324 mm (4.44 KN)	545 mm (6.52 KN)	635 mm (7.60 KN)	728 mm (7.73 KN)	1028 mm (10.92 KN)	1824 mm (19.36 KN)	1300 mm (13.80 KN)	1535 mm (14.75 KN)
1500 N/M	160 mm (4.44 KN)	269 mm (6.52 KN)	313 mm (7.60 KN)	359 mm (7.73 KN)	507 mm (10.92 KN)	900 mm (19.36 KN)	641 mm (13.80 KN)	757 mm (14.75 KN)

The above bay sizes are based upon using the Kee Klamp type 62 base fitting fixed perpendicular to the line of the Handrails.
 The figures shown in brackets are the required anchor pull out loads for the bay size indicated after all reduction factors have been applied.

Notes

- The Table is based on the maximum permissible bending moment of the tube
- All Rails same Tube Size as Uprights but in BS EN 10255 Medium Grade Tube
- Where Tube is to be used to form Ground Sockets:
 Tube Size 6 fits inside Tube Size 7 Medium Grade only
 Tube Size 8 fits inside Tube Size 9 All Grades

Specification Guidelines

The ultimate strength of any Guardrail is not only based on the materials used but also the Civil Structure to which the Guardrail is fixed and on the fixings or anchors used. Specifiers should consult a specialist fixings supplier for their current recommendation for anchors to meet different design loadings.

Construction Guidelines

While specification of the type of anchors used in an individual project is beyond the scope of this document, as a general rule of thumb the following example can be applied.

Using ground fix fitting number 62 to secure Guardrail to a concrete surface with the line of the anchors at 90° to the line of the railings and with uprights spaced according to the loading chart above, Mechanical Type Anchors of suitable dimensions will meet loadings up to 360N/m. For loadings of 740N/m or 1500N/m a Chemical Type Anchor should be considered.

STRAIGHT AND LEVEL GUARDRAILING (using Types 10, 15, 20, 21, 25 & 26)

Where:

L = distance between centres of uprights

l = length of horizontal tube

H = distance from ground to centre line of top rail

h = length of upright tube

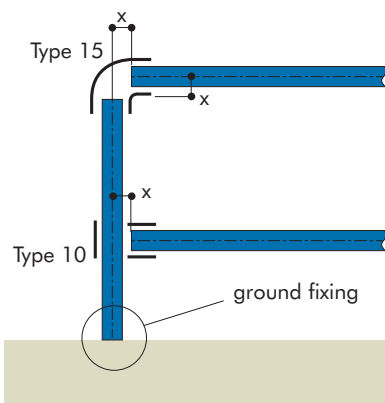
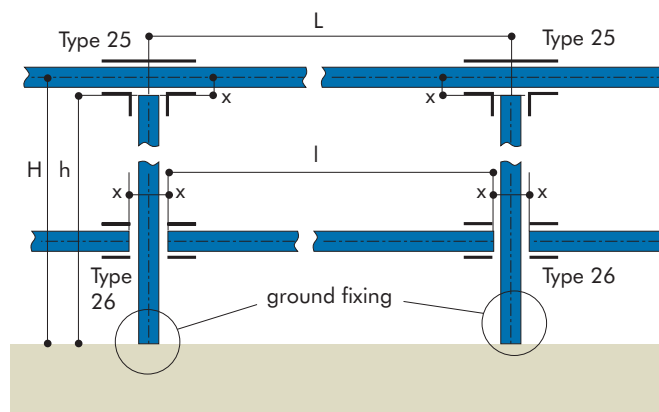


Table 1 gives details of dimension 'x' in the formula
 $l = L - 2x$ for calculating rail lengths and uprights
 $h = H - x \pm$ (ground fixing).

Table 1

Kee Klamp Fitting Size	x (mm)
2	-10
3	-12
4	-13
5	-14
6	-17
7	-22
8	-25
9	-30

NB: When reducing fittings are being used care must be taken to use the correct 'x' dimension.

Example, Type 10-87 (vertical tube size 8, horizontal tube size 7). To find the correct length of the horizontal tube, the length 'x' is that for the size 8 vertical tube.

When using Types 35 and 40 the above 'x' dimension should be used.

Although guardrailing is normally constructed in size 6, 7 and 8 tubing, Table 1 shows the cutting length for all Kee Klamp tube sizes, and can therefore be applied to many other rectangular structures.

GUARDRAILING UP SLOPES 0°-45° USING MACHINED FITTINGS

Where the upright remains vertical, i.e. ramps and stairways, (using Types 27, 28, 29)

(i) dimension 'x' to be subtracted from the upright centres dimension measured on the slope to give rail length. ($l = L - 2x$)

(ii) dimension 'y' to be added to the centre dimension to give the length of the upright. ($h = H + Y +$ ground fixing)

NB: between angles of 30° and 45° Type 29 fitting may be used to terminate the handrail, but for angles of less than 30° use a Type 10 with the rail bent to fit.

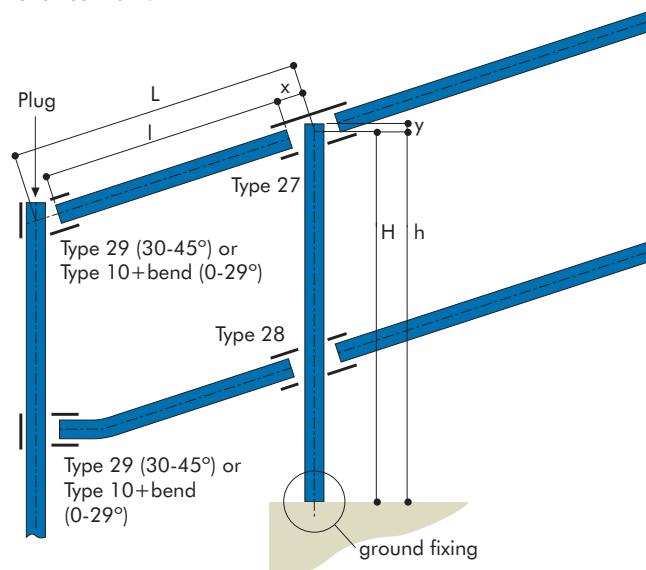


Table 2 gives details of dimensions required for calculating the rail lengths, where angles are between 0° and 45°.

Table 2: Rails

Angle of Slope°	Size 6 Fittings x (mm)	Size 7 Fittings x (mm)	Size 8 Fittings x (mm)
0° to 4°	-19	-22	-25
5° to 9°	-22	-25	-28
10° to 11°	-25	-28	-30
15°	-25	-32	-35
20°	-28	-32	-38
25°	-32	-35	-41
30°	-35	-41	-44
35°	-38	-44	-51
40°	-41	-48	-57
45°	-48	-54	-63

Table 3 gives details of dimensions required for calculating the upright lengths, where angles are between 0° and 45°.

Table 3: Uprights

Angle of Slope°	Size 6 Fittings y (mm)	Size 7 Fittings y (mm)	Size 8 Fittings y (mm)
0° to 4°	+19	+22	+25
5° to 9°	+16	+19	+22
10° to 11°	+16	+16	+19
15°	+13	+16	+19
20°	+13	+13	+16
25°	+9	+13	+16
30°	+9	+13	+13
35°	+9	+9	+13
40°	+6	+9	+9
45°	+6	+6	+9

GUARDRAILING UP SLOPES 0°-11°

Where the upright remains vertical, i.e. ramps and stairways, (using Types 86, 87, 88 and 89 - size 8 only)

- (i) dimension 'x' to be subtracted from the upright centres dimension measured on the slope to give rail length. ($L = L - 2x$)
- (ii) dimension 'y' to be subtracted from the centre dimension to give the length of the upright. ($H = h + Y + \text{ground fixing}$)

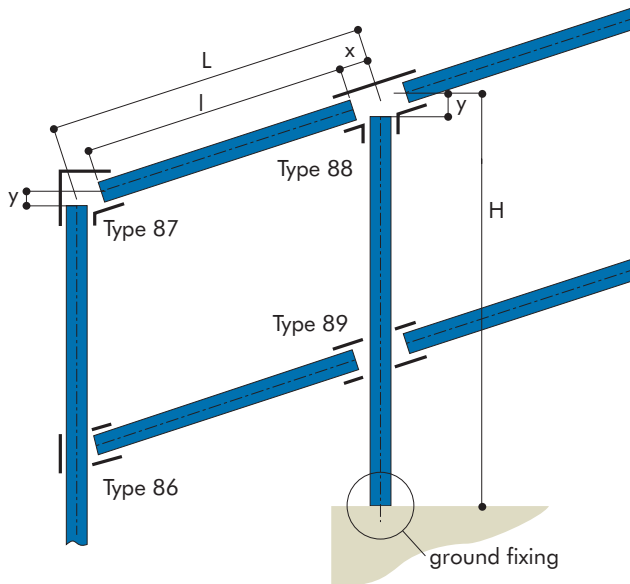


Table 4 gives details of dimensions required for calculating the rail lengths, where angles are between 0° and 11°.

Table 4: Rails

Angle of Slope°	Size 8 Fittings x (mm)
0° to 4°	-25
5° to 9°	-28
10° to 11°	-30

Table 5 gives details of dimensions required for calculating the upright lengths, where angles are between 0° and 11°.

Table 5: Uprights

Angle of Slope°	Size 8 Fittings y (mm)
0° to 4°	-25
5° to 9°	-28
10° to 11°	-30

GUARDRAILING UP SLOPES 30°-45° USING ADJUSTABLE FITTINGS

Where upright remains vertical i.e. stairways (using Types 29,30,55 and 56 - size 8 only)

- (i) dimension x, y or z to be subtracted from uprights centre. Dimension (L), to give the rail length.
- (ii) dimension u, v and w for determining the upright length.

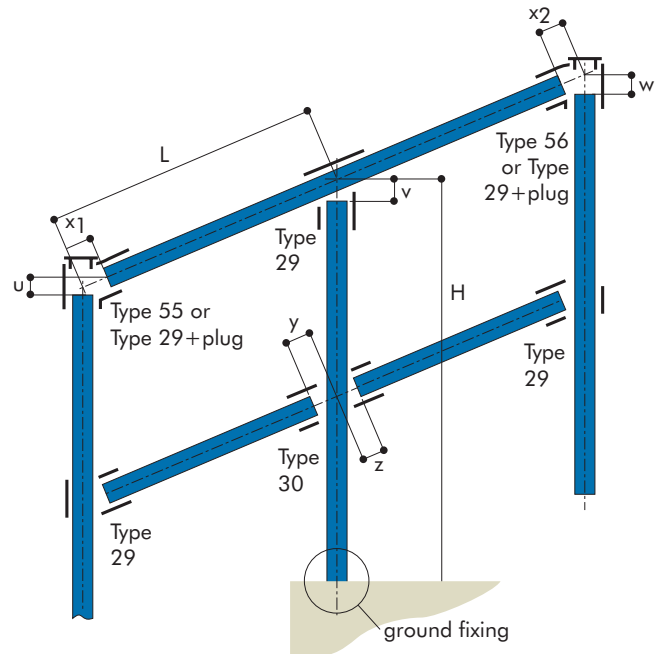


Table 6 gives details of dimensions required for calculating the rail lengths, where angles are between 30° and 45°.

Table 6: Rails using Type 29 & 30 fittings

Angle of Slope°	Size 6 Fitting			Size 7 Fitting			Size 8 Fitting		
	x (mm)	y (mm)	z (mm)	x (mm)	y (mm)	z (mm)	x (mm)	y (mm)	z (mm)
30°	-31	-54	-36	-40	-64	-41	-45	-77	-54
35°	-34	-51	-39	-44	-61	-44	-50	-73	-57
40°	-37	-48	-42	-48	-57	-48	-55	-64	-61
45°	-43	-45	-45	-54	-53	-52	-61	-65	-66

Table 7 gives details of dimensions required for calculating the upright lengths, where angles are between 30° and 45°.

Table 7: Uprights using Type 29 & 30 fittings

Angle of Slope°	Size 6 Fitting			Size 7 Fitting			Size 8 Fitting		
	U (mm)	V (mm)	W (mm)	U (mm)	V (mm)	W (mm)	U (mm)	V (mm)	W (mm)
30°	+36	-31	+24	+44	-40	+29	+46	-45	+33
35°	+42	-34	+18	+52	-44	+21	+55	-50	+24
40°	+49	-37	+11	+61	-48	+12	+65	-55	+14
45°	+58	-43	+2	+71	-54	+2	+77	-61	+2

Table 8: uprights and rails using Type 55 & 56 - size 8 only

	U (mm)	X ₁ (mm)	W (mm)	X ₂ (mm)
20° to 29°	-18	-18	-50	-50
30° to 39°	-16	-16	-60	-60
40° to 49°	-14	-14	-70	-70
50° to 59°	-12	-12		
60° to 69°	-10	-10		
70° to 79°	-8	-8		
80° to 88°	-6	-6		

SHELVING

(using Type 46)

Shelving with carrying rails positioned on the outside of the upright.

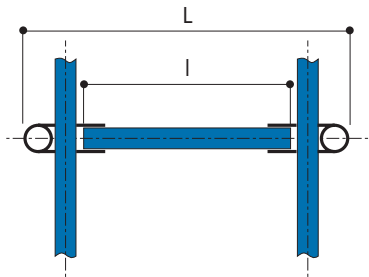


Table 9 gives the dimension 'x' to be subtracted from overall shelf width 'L' to give the length of the cross rail in the formula $l = L - x$.

Table 9

Kee Klamp Fitting Size	x (mm)
4	-98
5	-134
6	-162
7	-196
8	-228
9	-276

CONSTRUCTION OF BRACES AND STRUTS

(using Types C50, C51 and C52)

For economical use of tubing, Types F50-5 to F50-9 can all be combined with:

M50-5 to M50-9

M51-5 to M51-9

M52-5 to M52-8

to construct combination fittings, for example:

C50-75, C50-85, C51-655 and C52-855.

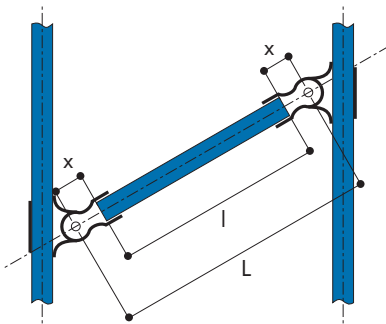


Table 10 gives details of dimension 'x' to be subtracted to give the tube length required for use with the fitting F50.

Table 10

Kee Klamp Fitting Size	x (mm)
4	-14
5	-25
6	-25
7	-25
8	-25
9	-32

NB: Dimension 'L' must be established by direct measurement, since it is dependant on the proposed angle of the strut.

PALLET RACKING

(using Type 46)

Pallet racking with the carrying rails on the inside of the upright.

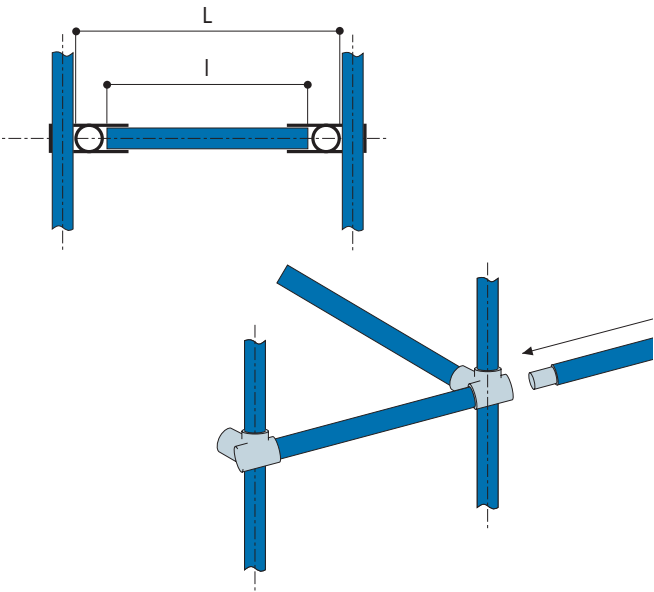


Table 11 gives dimension 'x' which must be subtracted from the overall width of the carrying rails, to give the length of the cross rail in the formula $l = L - x$

Table 11

Kee Klamp Fitting Size	x (mm)
4	-48
5	-59
6	-72
7	-85
8	-102
9	-126

Pallet racking is not recommended in less than size 7 tubing.

The length of the longitudinal member can be calculated from multiples of the length of the bay between the centres of uprights, plus dimension 'z' in Table 12. This applies to constructions using fitting Type 45.

Table 12

Kee Klamp Fitting Size	z (mm)
3	+24
4	+28
5	+31
6	+38
7	+46
8	+51
9	+61

Longitudinal tubes are joined using fittings Type 14 or 18, which must be positioned to occur at the edge of the Type 46 fitting, and must not all occur in the same bay at alternate levels.

Spigots can be either tubes or rods, riveted into position, or the Kee Klamp Type 18 fitting. When using the latter, a gap of 20mm must be allowed for the set screw fixing.

BASE & WALL FIXINGS

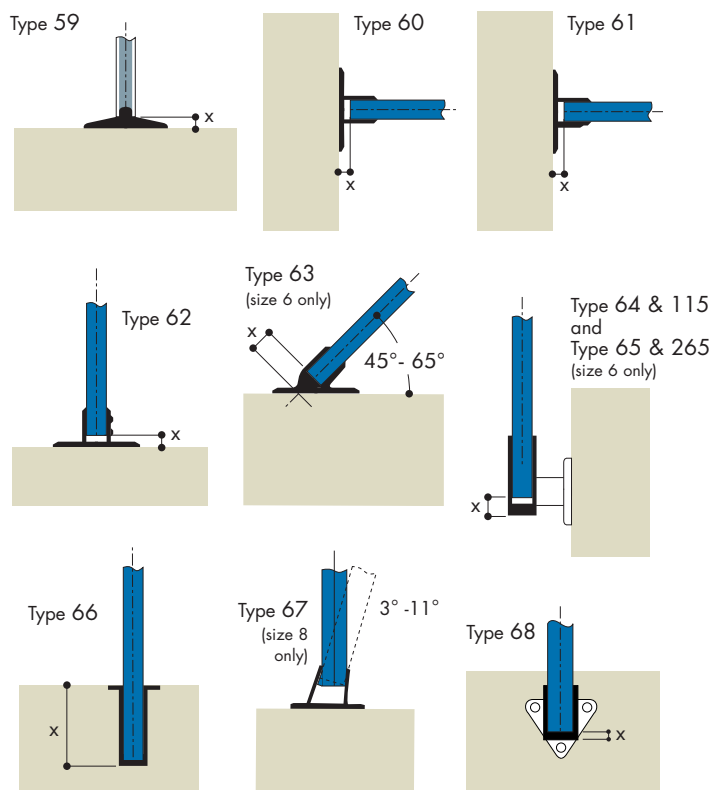


Table 13 gives details of the ground fixing dimension 'x', to be subtracted from the height 'H' to give the length of the upright 'h'.

Table 13

Flange Type	x (mm)
59	-10
60	-10
61	-6
62	-6
67	-6

Table 14 gives details of the ground fixing dimension 'x', for Type 63-6 only, to be subtracted to give the length of the upright for each angle condition.

Table 14

Angle°	x (mm)
45°	-38
50°	-32
60°	-25
65°	-12

Table 15 gives the dimension 'x' to be subtracted from the length of the upright for fittings, Types 64, 65, 67, 68, 115 and 265.

Table 15

Kee Klamp Fitting Size	x (mm)
6	-5
7	-6
8	-6

Table 16 gives the ground fixing dimension 'x', to be added to the upright member to allow for the setting into the socket Type 66.

Table 16

Kee Klamp Fitting Size	x (mm)
6	+115
7	+127
8	+127

PEDESTRIAN GUARDRAILING

(using Types 90, 91, 92, 93 and 95)

This construction is used when individual rails are required to be removable and when the site is not straight and level. Slopes of up to 7° or radii greater than six metres can be accommodated without bending the tubing.

When bending the tube around a corner, a Type 95 PGR spigot must be included to prevent sagging. Holes of 15mm diameter must be drilled through both walls of the upright, one at 25mm from the top of the upright tube and the other on the centre line of any horizontal rails.

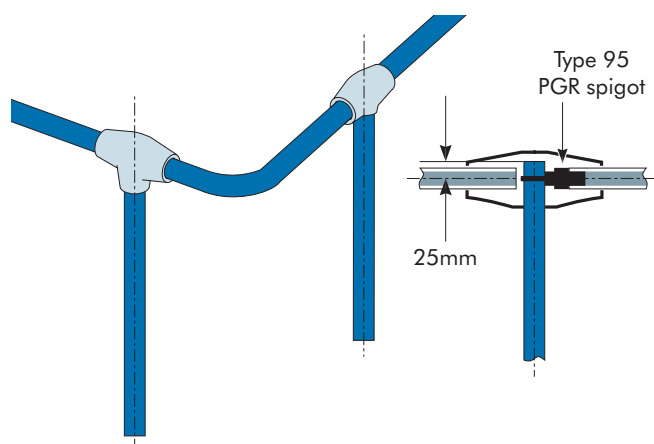
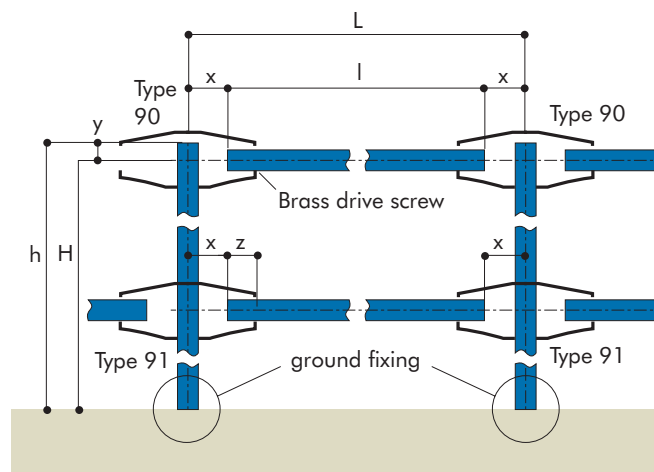


Table 17 gives details of:

(i) Dimension 'x' in the formula $l = L - 2x$ for calculating the rail lengths where:

L = distance between the centres of the uprights
l = length of the horizontal tube.

(ii) Dimension 'y' in the formula $h = H + y + (\text{ground fixing})$ for calculating the upright length where:

H = distance from ground to the centre line of the top rail
h = length of upright tube.

Table 17

Kee Klamp Fitting Size	x (mm)	y (mm)
8	-66	+25

A brass drive screw (No 6 x 10mm) is located at dimension 'z', in Table 18, on one end only for each horizontal tube. This positions the horizontal tube within the Kee Klamp Fitting to give location relative to the set screws.

Table 18

Kee Klamp Fitting Size	z (mm)
8	37

WIRE MESH INFILL

Infilling is normally constructed from 50mm x 50mm x 3.2mm, 25mm x 25mm x 3.2mm or 50mm x 25mm x 3.2mm wire mesh welded to a 8mm rod frame, and is fixed into position using standard Kee Klamp Fittings Types 81 and 82.

NB: Types 81 and 82 require cut outs on mesh less than 32mm square.

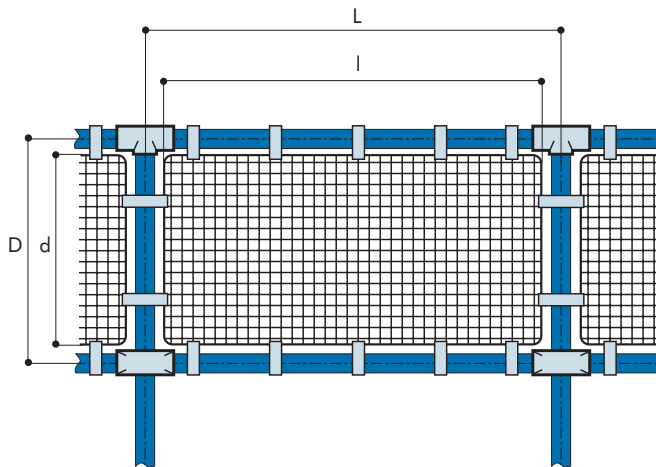


Table 19 gives the dimensions to be subtracted from the centre dimensions 'L' and 'D' of the structure to give the formulae $L = L - x$ and $d = D - x$.

Table 19

Kee Klamp Fitting Size	x (mm)
5	-60
6	-76
7	-86
8	-89
9	-98

Warning, the spacing of panel clip Types 81 and 82 should not exceed 450mm centres. The safety attachment incorporated in the panel clip Types 81 and 82 cannot be used with mesh less than 32mm.

TUBE BENDING

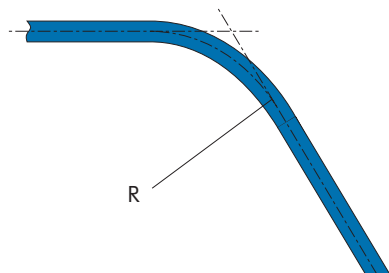


Table 20 gives details of standard radius 'R' of the tube bent by Kee Klamp Ltd.

Table 20

Kee Klamp Fitting Size	R (mm)
3	57
4	57
5	90 or 98
6	102
7	135
8	152
9	203

If the above standard radii are not suitable, tube sizes 5 to 9 can be rolled to any radius above a minimum of 500mm.



FITTING ALTERNATIVES



Less rigid. Can be added to structure after assembly.



Tubes can be joined within the fitting.



Internal joint. Joint less rigid.



Requires a longer tube. Fitting 84 can be used instead of the 77.



Requires a longer tube. Fitting 84 can be used instead of the 77.



Requires a longer tube. Fitting 84 can be used instead of the 77.



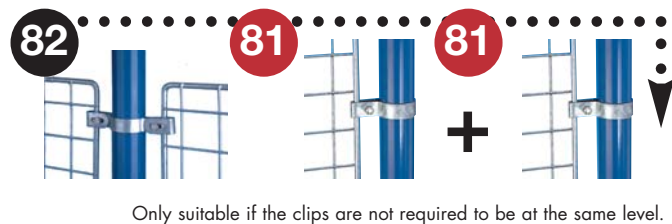
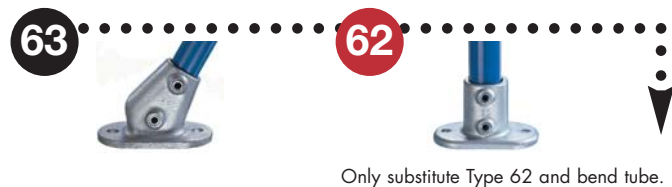
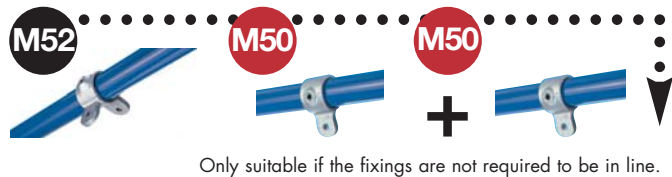
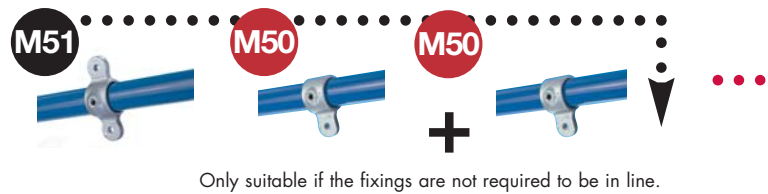
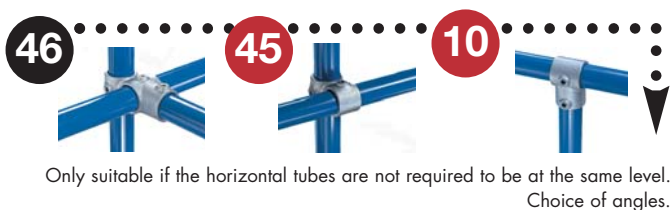
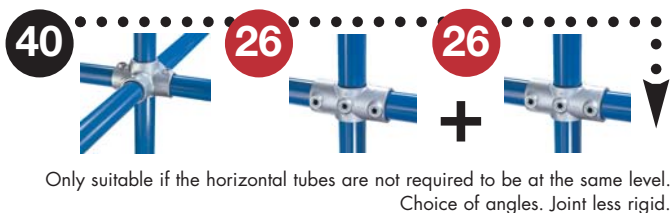
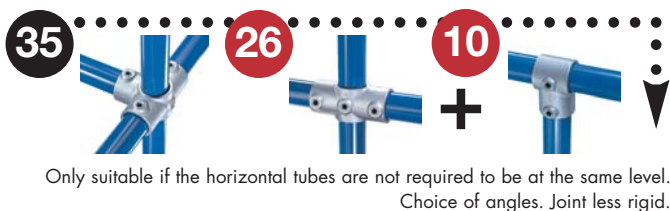
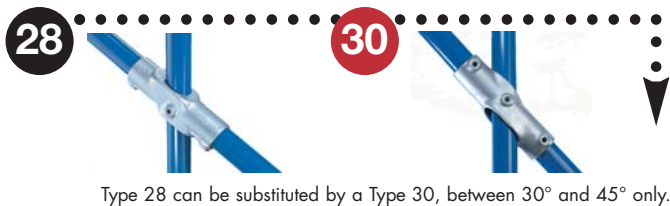
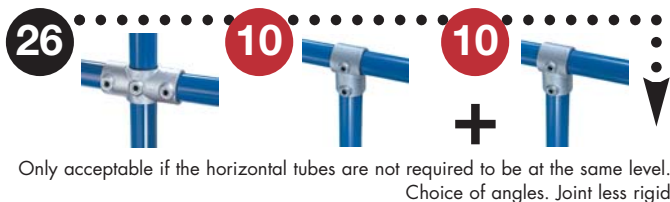
Only acceptable if the horizontal tubes are not required to be at the same level.
Choice of angles. Joint less rigid.



No facility for joining tubes inside the sleeve.



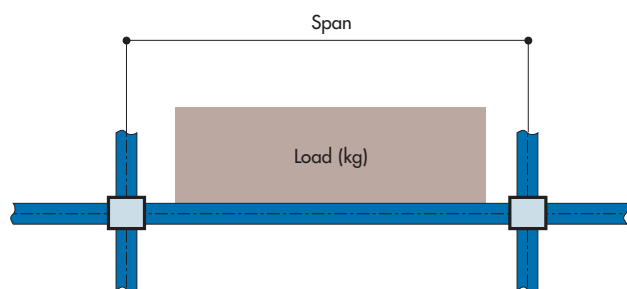
Type, 45 can be considered if a crossover joint is acceptable.
No facility for joining tubes inside fitting.



RACKING LOAD TABLES

Table 21: Beam load table (kg)

Span (M)	Fitting size					Span (M)
	5	6	7	8	9	
	26.9mm x 2.6	33.7mm x 3.2	42.4mm x 3.2	48.3mm x 3.2	60.3mm x 3.6	
0.5	540	1060	1750	2380	4000	0.5
0.6	435	850	1407	1870	3250	0.6
0.7	375	730	1207	1595	2760	0.7
0.8	330	645	1063	1385	2420	0.8
0.9	295	579	946	1230	2160	0.9
1.0	265	525	850	1110	1950	1.0
1.1	240	478	770	1013	1775	1.1
1.2	219	438	705	930	1625	1.2
1.3	202	403	651	858	1497	1.3
1.4	187	373	604	796	1387	1.4
1.5	175	347	564	741	1290	1.5
		325	529	693	1205	1.6
		306	499	650	1129	1.7
		290	472	613	1061	1.8
		277	448	581	999	1.9
		268	427	553	987	2.0
			408	528	944	2.1
			391	505	855	2.2
			376	485	818	2.3
			362	467	785	2.4
			349	450	755	2.5
				434	728	2.6
				419	703	2.7
				405	680	2.8
					659	2.9
					639	3.0
					620	3.1
					603	3.2
					588	3.3
Safety Factor 2					575	3.4
					564	3.5



The table gives an indication only of the safe load, uniformly distributed, in kg., that may be carried per shelf consisting of front and back tubes when used as continuous beams.

For uneven load distributions or single spans, the required tube size must be determined by standard bending moment calculations assuming a Kee Klamp joint to give a simply supported beam.

At loads greater than 900 kg consideration must be given to set screw slip.

Table 22: Upright load table (kg)

Length (M)	Fitting size					Length (M)
	5	6	7	8	9	
	26.9mm x 2.6	33.7mm x 3.2	42.4mm x 3.2	48.3mm x 3.2	60.3mm x 3.6	
0.3	1720	2950	4038	4783	7044	0.3
0.4	1435	2617	3703	4446	6661	0.4
0.5	1150	2284	3368	4109	6278	0.5
0.6	910	1951	3033	3772	5895	0.6
0.7	725	1618	2690	3435	5512	0.7
0.8	590	1348	2363	3098	5129	0.8
0.9	480	1128	2028	2761	4746	0.9
		948	1752	2424	4363	1.0
		798	1524	2134	3980	1.1
			1340	1884	3597	1.2
			1188	1668	3253	1.3
			1066	1484	2951	1.4
				1328	2681	1.5
					2441	1.6
Safety Factor 1.74					2226	1.7
					2032	1.8
					1857	1.9
					1697	2.0

Loads specified are in kg

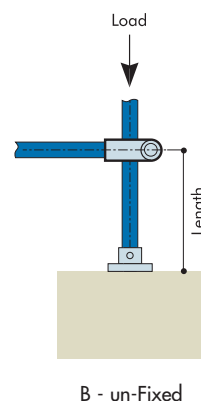


Table 22 gives an indication only of the safe load, in kg., that may be carried between the above restraints by single tubes to BS EN 10255 (ISO 65) when used as uprights.

Table 23: Upright load table (kg)

Length (M)	Fitting size					Length (M)
	5	6	7	8	9	
	26.9mm x 2.6	33.7mm x 3.2	42.4mm x 3.2	48.3mm x 3.2	60.3mm x 3.6	
0.3	1860	3086	4192	4916	7250	0.3
0.4	1600	2810	3910	4638	6930	0.4
0.5	1360	2534	3628	4360	6610	0.5
0.6	1140	2258	3346	4082	6290	0.6
0.7	940	1982	3064	3804	5970	0.7
0.8	775	1706	2782	3526	5650	0.8
0.9	640	1471	2500	3384	5330	0.9
1.0	540	1269	2235	3248	5010	1.0
		1092	1995	2970	4690	1.1
		937	1779	2692	4370	1.2
			1587	2414	4050	1.3
			1417	2169	3730	1.4
			1265	1954	3410	1.5
			1130	1764	3130	1.6
				1602	2890	1.7
				1462	2680	1.8
				1342	2480	1.9
Safety Factor 1.74				1242	2300	2.0
					2120	2.1
					1950	2.2
					1800	2.3
					1650	2.4

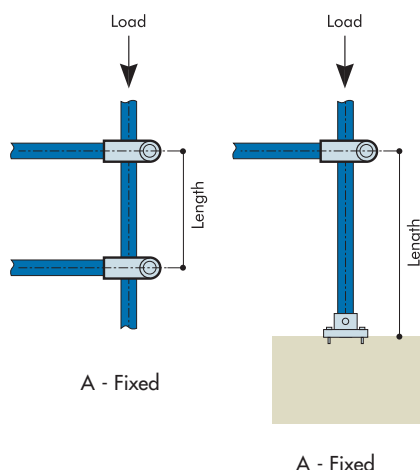


Table 23 gives an indication only of the safe load, in kg., that may be carried between the above restraints by single tubes to BS EN 10255 (ISO 65) when used as uprights.

TEST REPORT: Vibration of Kee Klamp Assemblies

Exhaustive tests on samples of standard size 7 Kee Klamp fittings were performed by an independent research laboratory. The purpose of the test was to evaluate the use of either standard set screws or self-locking set screws.

Test Arrangement

A "Tee" section test assembly was made using three 300mm lengths of galvanized size 7 standard pipe held together by a socket Tee fitting (code 25-7). The vertical leg of the test assembly was supported in a standard railing flange (code 62-7). The completed assembly was then rigidly attached to the vibration table.

The test assembly was initially assembled using standard set screws and tested in this configuration. The standard set screws were then replaced with the locking screws and the tests repeated.

Test Procedure

The test was conducted on a Ling 667 kg Electromagnetic vibration table.

The table was programmed to perform a resonance search between 25 and 350 Hz. and resonant frequencies were recorded and shown in Table 24.

During the resonance search amplification factors, Q, were measured at each resonant frequency, the point of reference being the end of one horizontal pipe. The table was then held at one of the resonant frequencies, set in motion with a controlled acceleration level of 4g, and ran for a period of six hours. This was repeated for three more resonant frequencies in descending order of "Q" factor.

Table 24: Test results

Resonance Frequencies	Q Factor	Running Time
74	1.27	Nil
106	1.27	Nil
158	1.53	6 hours
200	1.8	6 hours
221	5	6 hours
295	9	6 hours

During the twenty-four hours of vibration at the four resonant frequencies above no signs of loosening with either type of attachment screw occurred.

TELESCOPIC RELATIONSHIP

Telescopic relationship between tubes to BS EN 10255 (ISO 65)

Size 9 heavy	- will accept 8 heavy or medium
Size 9 medium	- will accept 8 heavy or medium
Size 8	- no telescopic relationship Requires special spigotting material
Size 7 heavy	- will only accept size 6 light
Size 7 medium	- will accept 6 light, medium and heavy
Size 6 heavy	- no telescopic relationship Requires special spigotting material
Size 6 medium	- will only accept size 5 light
Size 5 heavy	- no telescopic relationship Requires special spigotting material
Size 5 medium	- no telescopic relationship Requires special spigotting material
Size 4	- no telescopic relationship Requires special spigotting material
Size 3	- no telescopic relationship Requires special spigotting material
Size 2	- no telescopic relationship Requires special spigotting material



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